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- Editor

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CONTENT

Application of Information and Communication Technology (ICT) in Agriculture Value Chains in India

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Abstract

Information and Communication Technology (ICT) has led to ease of operations in the value chain of the agriculture sector, where the number of actors in the value chain is holding it back in the realisation of its full potential. These inefficiencies arise due to the non-adoption of technology in certain stages of the value chain. This issue of inefficiencies can be resolved with the help of an end to end solution in the total supply chain. Certain recent initiatives of the government and the private sector in India towards using Information and Communication Technologies (ICTs) in terms of market information, input availability, and post-harvest management like geotagging of agri warehouses, reefer vehicles and cold storages are a step in the right direction. Further, to address the issue of access to these technologies by smallholders, certain innovative pilot projects are being developed. Non-profit as well as private sector initiatives in this space are also highly encouraging. An attempt has been made in this paper, to evaluate opportunities and constraints associated with the use of ICT to enhance the productivity of agriculture and associated sectors in India.

Keywords: ICT, Value chain, Agricultural Marketing.

Introduction

The Indian agriculture sector (US$ 370 billion) plays a vital role in the Indian economy. The country's total geographical area is 328.7 million hectares with a cropping intensity of 143.6 per cent. India has 15 agro-climatic regions and 46 types of soil. India ranks first in terms of production of spices, pulses, milk, tea, cashew, and jute, and stands second in

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the production of wheat, rice, fruits and vegetables, sugarcane, cotton, and oilseeds. Further, India is the second largest producer of fruits and vegetables and is the largest producer of mango and banana. The contribution to GDP by the agriculture sector is likely to be 19.9 per cent in 2020-21, increasing from 17.8 per cent recorded in 2019-20 (Economic Survey 2020-21).The government has taken many initiatives to aid and enhance the agriculture sector with proven farming technologies and supportive policies. The evolution in digital technology for farming will further accelerate growth by ensuring higher crop yields. It will also help to enhance sustainability by reducing water consumption and the use of agrochemicals (Goutam, 2014).

Conflict of Interest in Agricultural Marketing

The farmers always expect higher production and maximum price for their harvest. On the other hand, the traders, retailers and manufacturers expect to get high quality raw material at a low purchase price with a higher margin. The consumers desire to get good quality and fresh produce at a reasonable price at their doorstep. This conflict of interest of different players in the agricultural value chain is a result of the fragmented supply chain prevalent in Indian agriculture. There are two ways to overcome this problem; firstly all the supply chain activities have to be brought under a single umbrella and second, we need to take the help of the advent of ICT to design an end to end solution. Against this backdrop, an attempt has been made in this paper to analyse various initiatives of ICTs in agriculture in general and Agricultural Marketing in particular (Chatarjee & Kapur, 2016).

Characteristics of Conventional Marketing System

In the conventional agricultural marketing system, farmers prefer to sell their commodities at the village level. Around 80-90 per cent of perishable commodities, 40-80 per cent of cash crops and 20-60 per cent of food grains are sold in the local markets. The main reasons for this distress sale are indebtedness, inadequate transport, small surplus, inefficient supply chain, perishability of produce, information gap, etc. It is essential for farmers to know the market and accordingly plan their produce and then grow it. The trend has been shifting now from production led to market-led extension.

Integration of Agricultural Production and Marketing

It is vital to integrate the production and marketing activities for agricultural produce. There is a need to disseminate knowledge on basic dimensions of agricultural marketing

viz., market-oriented production planning, and preparation of produce for marketing, storage/preservation techniques, infrastructure and transport facilities, market information and integration of marketing networks.Market oriented production planning like what to grow, when, where and how to grow is very essential at the farmers' end, followed by preparation of the produce for marketing, through grading sorting, packaging and labeling which has to be done to secure the maximum price. The next step is storage/preservation techniques, to add value to the produce, after which it is essential to ensure infrastructure and transport facilities to reduce the post-harvest losses. Additionally, the use of market information in terms of arrivals and prices and integration of marketing networks like direct sale, wholesalers etc., is necessary to secure better prices by farmers (Darekar & Gummagolmath, 2021).

Need for the study

ICT based initiatives are using different technologies, but with a limited reach to the intended stakeholders. This limited reach is mainly on account of tele-infrastructure, lack of awareness, literacy level and information needs of the farmers. However, in the recent past, the predominance of tele-infrastructure, availability of internet facilities and advent of social media has minimized inefficiencies in the value chain of agriculture. However, the reach of ICT to all the stakeholders is a far cry.

Hence, it is essential to analyze the extent of the reach of both public and private ICT initiatives in agriculture.

Digitalization of Agriculture

Over the years, the government has taken major steps to aid and enhance the agriculture sector with proven farming technologies and supportive policies. The recent evolution of digital technology in farming will further accelerate growth by ensuring higher crop yields and enhance sustainability by reducing water consumption and the use of agrochemicals. Digital technologies, such as the Internet of Things (IoT), Machine Learning (ML), Artificial Intelligence (AI), Remote Sensing, Big Data and Blockchain are modernizing operations and transforming the entire agricultural value chains. Although several countries, such as the USA, Netherlands, Israel and Australia have successfully adopted digital solutions to revolutionise agriculture, their adoption in India is still in a nascent stage. The future adoption of digital agriculture in India is anticipated to nurture under the Public-Private Partnership (PPP) mode.

Information and Communication Technologies (ICTs)

Information and Communication Technologies (ICTs) is an umbrella term that includes any communication device or application, encompassing: radio, television, mobile phones, computers and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as video-conferencing and distance learning. ICT is simply an electronic means of capturing, processing, storing and disseminating information. It comprises those networks, mobiles, devices, services, and applications that aid the processing, management, and exchange of data, information, or knowledge with a target audience. They include a broad range of converging technologies, including traditional telecommunications, television and video, radio, CD-ROMs, cell phones and smart devices, and several modern technologies such as computers and the internet, sensors, Geographic Information Systems, satellites, and the like. Essentially, the purpose of ICT is to transfer information from one point to another (Adhiguru & Devi, 2012).

Why ICT?

ICTs have largely revolutionised the way people, governments, and businesses, both large and small, function in the modern world. Close to 60 per cent of the global population has access to the internet, and mobile internet is now the most widely-used channel for internet access worldwide. The tremendous adoption of ICTs has made it possible to facilitate better communication and ensure the delivery of services and information to people who previously lacked access. The infusion of new, advanced technologies has allowed the global agriculture sector to surge ahead and transform the way producers cultivate, harvest, and distribute agricultural commodities. The use of ICT in agriculture, or e-agriculture, has accelerated agricultural and rural development by adopting innovative ways to improve the existing information and communication processes. It has particularly revolutionised smallholder agriculture in several agrarian economies and has helped address several challenges associated with the traditional form of agriculture. ICTs are meeting information, communication, and knowledge needs of farmers, agribusinesses, governments, and society through different features like e-collaboration, distance neutral, interactive, mobility, market transparency etc. (Deshmukh and Patil, 2021).

What ICT Can Deliver?

ICT has many potential applications in delivering agricultural extension and can bring new

information services to rural areas by reaching every corner of the country. All stakeholders of the agriculture industry need information and knowledge and ICT can play a significant role by creating an interface for the farmers to the outside world. The collaborative business modules can offer entrepreneurship opportunities and also deliver information regarding the prices of commodities in various mandis (agricultural markets). ICTs are cost effective and ensure timely as well as accurate information dissemination amongst the stakeholders. ICTs can also be linked with other governance services to be delivered in rural areas.

Table 1: Successful ICT Initiatives in India

The list of few successful ICT initiatives in India is given below.

S.No	Initiative	Details
1.	e-Extension (e- Soil Health card Programme)	Dept. of Agriculture, Gujarat State has one of the ambitious programmes which aims to analyze the soil of all the villages and provide guidance
2.	AGRISNET	It uses state-of-the-art broadband satellite technology to establish the network within the country by MOA&FW. It is a comprehensive web portal, to broadcast relevant information to farmers, which was initiated and funded by the Ministry of Agriculture, Government of India. The AGRISNET serves farming community by disseminating information and providing services through use of ICT.
3.	AGMARKNET 2000	A comprehensive database which links together all the important agricultural produce markets in the country for dissemination of market information by DMI. It aims in empowering decision-making ability of the farmers regarding selling of their produce. This portal was developed to pace up the agricultural marketing system through broadcasting information about influx of agricultural commodities in the market and their prices to producers, consumers, traders, and policy makers transparently and quickly.

4.	Kisan Call Centres (KCC) 2004	KCCs were commenced by the Department of Agriculture and Co-operation with the main intent of delivering extension services to the farming community in the local languages. The queries of farmers are answered by agricultural graduates on help line, toll free number in their local language. The agricultural scientists also visit the field in person to get an idea about complex agricultural problems to resolve them. It is delivering extension services to the farming community
5.	Tata Kisan Kendra	This private initiative by TATA chemicals ltd. started with an objective of providing the farms with infrastructure support, operational support, controlling farm activities etc. with the advent of ICT.
6.	e-Choupal	This is ITC's Agri Business Model, a conglomerate, to link directly with rural farmers via the Internet for procurement of agricultural and aquaculture products like soybeans, wheat, coffee, and prawns.
7.	AKASGANGA (Meaning "milky way" in Hindi)	It demonstrates the potential of information technology to impact livelihoods in poor, rural communities. This ICT project makes possible milk collection, fat testing, and payment in a timely and user friendly manner. It augments the income generation of dairy farmers through incorporation of advanced technology.
8.	Global Positioning System (GPS)	A satellite-based navigation system that can be used to locate positions anywhere on the earth
9.	Remote sensing (RS)	It is the science of making inferences about material objects from measurements, made at distance
10.	Geographic Information System (GIS)	It is a technological tool that analyzes and presents information tied to a spatial location
11.	ICTs in Weather Forecasting	These disseminate meteorological information and weather warning, climate change

12.	Digital green	It is an international organization, which works with a participatory approach by engaging the rural community to improve their livelihood using a digital platform. Interactive and self-explanatory videos are prepared for farmers by progressive farmers with the assistance of experts. These videos are shown to the farmers at individual level or in groups. The videos are prepared keeping in view the requirements and welfare of the rural masses.
13.	Warana (1998)	The Warana "Wired Village" project was initiated with the objective of providing agricultural information and services to farmers for increasing productivity. The information about prices of agricultural outputs, employment schemes of the government of Maharashtra and educational opportunities is transmitted to the farmers in the local language. The information is disseminated through information kiosks with the help of operators, who are the main linkage between the farmers and the agricultural experts.
14.	IFFCO KISAN SANCHAR LTD (IFFCO Kisan) (2012)	It delivers relevant information and custom-made solutions to the concerned farmers through voice messages on mobile phones. The farmers can also communicate directly to the agricultural experts on explicit themes via 'phone-in' programmes.
15.	Digital Mandi	It is an electronic trading platform for facilitating farmers and traders to sell and procure agricultural produce beyond the geographical and temporal limitations effortlessly. Various financial institutions also participate in online trading of agricultural output to remove cash crisis.
16.	eArik (2007)	It aims to disseminate climate smart agricultural practices and to achieve food security. It is an integrated platform to enhance the accessibility of agricultural information and technology in north-eastern India. It delivers agricultural

		specialist advice on crop cultivation, crop management and marketing. Farmers can also obtain information directly from the portal but field workers also help farmers to access ICT- based information or to consult with other agricultural experts.
17.	aAQUA (Almost All Questions Answered)	It is a multilingual online system that facilitates farmers by advising them, solving their problems and answering their questions related to agriculture. Farmers have to register on aAQUA platform online or telephonically. After that, they can post their queries on the portal, for which they get answers shortly.
18.	Fisher Friend Mobile Advisory KCC	The Fisher Friend Programme (FFP) of M S Swaminathan Research Foundation was launched in 2009 to protect fisher folk from occupational hazards and to empower their livelihoods. The relevant information on wave height, wind speed and direction, potential fishing zones, relevant news, government schemes and market price is provided to fishermen in the local language. The FFP covers marginalized coastal communities in Tamil Nadu, Puducherry, Andhra Pradesh, Kerala, and Odisha, and is operational in English, Tamil, Telugu, Malayalam, Odiya languages.
19.	Reuters Market Light (RML) (2007)	It was initiated to deliver customized information to the registered farmers via mobile-SMS. It disseminates information in eight local languages in 13 states.
20.	SMS Portal/mKisan Portal	This portal aims to serve farmers in three ways - to disseminate information about diverse agricultural activities, provide seasonal advisories and to provide various services directly to farmers through SMSs in their local languages. The SMS Portal has a platform for amalgamation of service delivery under different sectors viz. Agriculture, Horticulture, Animal Husbandry and Fisheries.

21.	Mahindra Kisan Mitra	This portal provides information to the farmers on price of commodities, weather forecast, crop advisories, loans, insurance, cold storage and warehouses along with success stories of progressive farmers.
22.	Village Knowledge Centers (VKCs) 1998	Village knowledge centres of MS Swaminathan research foundation were initiated in Pondichery as a gateway to technical information related to agricultural inputs, price of outputs, crop rotation, use of fertilizers and pesticides. Information is disseminated through public address system.
23.	Agronxt	AgroNxt platform is a multitasking platform for the farmers where farmers can get inputs, agriculture advice, weather condition etc. AgroNxt thrives to contribute to agriculture industry by delivering farmers usable, reliable and timely information that maximizes farm profitability. It assists in upholding agricultural productivity and sustainability.

Importance of Market Information

The market information about arrivals and prices of agricultural produce is very vital to the farmers for taking proper production and marketing decisions. Well-analyzed historical market information enables farmers to allocate their resources among different crops in line with the urban consumer demand, including those related to new crops and regulate the flow of produce to markets. The traders can rationally take a call on when and where to buy and sell, plan for transport, storage etc., while consumers can make informed decisions to purchase the produce by knowing the market forces. Finally, market information can also assist the government in planning, management of the economy, formulation of price policy, watching its execution, discovering trends and deciding the future course of action to keep the market prices within desired limits. It also acts as an Early Warning system by highlighting food shortages which are reflected by higher prices.Hence, a key to achieving both operational and pricing efficiency in the marketing system is the dissemination of complete and accurate market information (Shalendra et al., 2011).

Essentials of Market Information and Flows

Market information can be regarded as a public good, particularly where there are a number of small farmers who are unable to pay for information. The availability of timely, analysed, accurate and applicable information to all interested parties is therefore essential, irrespective of source. The need to provide up-to-date price information is particularly essential in the case of perishable produce and where price fluctuations are frequent. Many countries have attempted to provide market information at the national level, but their success rate has been poor. Market Information Services have repeatedly proven to be unsustainable and where they have endured they have often failed to provide commercially useful advice, confining themselves to the gathering of, frequently unused, data.

The supply chain in agriculture not only means the flow of the commodity but also that of information. The term market performance refers to the economic results that flow ranging from the seed/pesticide supplier, farmers, transporters, storage, markets, processing, packing, retailing to consumers. ICT offers new opportunities for decision-making, adaptation to the environment and efficient operation.

Table 2: Current Initiatives under Digital Agriculture in India

The list of current Initiatives under Digital Agriculture in India is given below.

S.No	Year	Initiative
1	September 2021	Govt of India announced the initiation of the Digital Agriculture Mission 2021-2025, while signing five Memorandum of Understanding (MoUs) with Jio Platforms Limited, Ninjacart, CISCO, ITC Limited and NCDEX e-Markets Limited (NeML), to take forward digital agriculture through pilot projects. It aims to support and accelerate projects based on new technologies, like blockchain, AI, Remote sensing and GIS technology and use of drones and robots.
2	June 2021	An MoU with Microsoft to run a pilot programme for 100 villages in 6 states. Under the MoU, Microsoft is expected to create a 'Unified Farmer Services Interface'

		through its cloud computing services. This is a major part of the ministry's future plan to create 'AgriStack' - a unified platform to provide end-to-end services across the agriculture food value chain to farmers. Govt. is planning to create unique farmer IDs for farmers across the country to integrate it with various government schemes and create digital agricultural ecosystems.
3	Mar 2021	ITC has proposed to create a personalized 'Site Specific Crop Advisory' service to turn conventional crop-level generic advice into a personalised site-specific crop advisory for farmers, using a digital crop monitoring platform, hosted on ITC's e-Choupal 4.0 digital platform. The pilot project will be at Sehore and Vidisha (Madhya Pradesh).
4	February 2020	The Jio Agri (JioKrishi) platform launched, digitises the agricultural ecosystem along the entire value chain to empower farmers. The advanced functions use data from various sources, feed the data into AI/ML algorithms and provide accurate personalised advice. The pilot project will take place at Jalna and Nashik (Maharashtra).
5	August 2019	An Agricultural Digital Infrastructure (ADI) solution developed by CISCO to enhance farming and knowledge sharing. It is likely to play a vital role in the data pool that will be created by the Department of Agriculture under the National Agri Stack. The pilot project will take place at Morena (Madhya Pradesh) and Kaithal (Haryana).
6	April 2016	National Agriculture Market (eNAM) is a pan-India electronic trading portal that links the existing Agricultural Produce Market Committee (APMC) mandis, to create a unified national market for agricultural commodities. eNAM helps farmers sell products without the interference of any brokers or mediators, by generating competitive returns from their investment
7	January 2013	Direct Benefit Transfer (DBT) Central Agri Portal is a unified central portal for agricultural schemes across the country. The portal helps farmers adopt modern farm machineries through government subsidies

Need of the Hour

Agriculture is facing new challenges but the stakeholders involved in the agriculture sector are yet to benefit from ICT. There are different tools to access essential information regarding quality seeds, agriculture finance, irrigation, livestock care and market prices. The service providers shall also charge for value-added premium services for demand driven information instead of offering it free. The collaborative business modules over the single supplier, multimedia supported information than text services and cost effective innovative solutions would have added benefits than costly technology. The need of the hour is to use modern media over traditional media and share localised and crop specific information than the generic one.

Information Management across the Agri value chain

The biggest obstacle of a farmer-centric and farmer-driven economy is first and last mile connectivity as it requires a lot of time and resource management. Information management plays a key role from crop production, procurement, storage and logistics to the marketing of agricultural produce. The well connected agri value chains can offer an incentive for members of the entire agri ecosystem and food supply. A continued engagement with farmers creates multiple inputs and revenue streams for businesses. The current condition can be leveraged to use ICT and develop robust agri value chains in India. Indian agriculture needs to grow more on a systemic basis from the pandemic. It is the right time to build connectivity within the value chains by driving investment and creativity in digital agriculture. The connected agri value chains need to be developed with the help of ICT. This needs more effort and strong alliances between the Centre and state governments, private players, and farmers.

ICT Uses in Agribusiness Value Chains

ICTs play an important role in agricultural value chains and have a diverse impact. The different types of ICT having different strengths and weaknesses can be applied to particular interventions. Although ICTs have positive impacts, many rural farmers still do not have access to or the capacity to use ICT. Given the importance of the context and the rapid development of technology, it can be difficult to determine whether the appropriate tool now will continue to be the appropriate tool in the future. ICT can be applied in various

agribusiness enterprises like Agri-tourism, Agri-banking, Agri-Hubs, Food Traceability and Online Farmers' Markets.

Driving Forces in ICT Market Integration

Many a time the government policies and frameworks are one of the driving forces behind digitalization as it creates an enabling environment for competitive digital markets and e-services. The use of social media, rapid technological advances, the discovery of new sources of competitive advantages, the pursuit of first mover advantages, need for real-time engagement and need for value chain coordination are the driving forces behind the ICT market integration.

e-Value Creation in Agribusiness: Product & Service Transformations

Digital platforms are new economic institutions functioning in a new reality characterized by being transaction intermediaries while giving rise to new economic ecosystems and new value creation logic. A fragmented digital agriculture ecosystem has been linked to the slow scale-out of digital platforms and other digital technology solutions for agriculture. The agribusiness products and services can be transformed by creating e-value through automation of farm production, access to market information services, food supply chain traceability and customization of e-agriculture services (Saravanan & Darekar, 2020).

Impact of ICT in Agriculture

The effective distribution of ICT can increase agricultural attractiveness by reducing transaction costs, raising production, efficiencies and farmers' incomes, by providing more information and value to stakeholders. In recent years, information and communication technologies have been introduced in agriculture projects and have provided fruitful results in rural and agriculture development (Meena & Singh, 2012). For instance, information and communication technologies can be used for distance learning programs and help the farmer in learning about new approaches and technologies for agricultural development in developing countries. Such technologies can provide information on weather, prices, and profitable income. ICT offers the opportunity to enhance smallholder marketing in the following ways. It is evident that those farmers who have used the information and communication technologies in agriculture have increased their production information

and knowledge. Similarly for those who have used the e-services, e-commerce applications also increased their income. ICT has its impact at the household as well as the national level. ICT has helped in resolving market failure and given access to food and financial markets. The new early warning systems have helped climate change management. Due to income growth, food access, food security improvements have been witnessed. ICTs have helped in alleviating rural poverty, developed knowledge and improved value chain performance through regional/global market integration (Satapathy, 2015).

* Better production management and data analytics: ICT solutions are providing better farm management and data analytics solutions to improve marketing capabilities. Farmers can take informed decisions and plan their production accordingly.

* Finding Buyers/Market: Identifying additional buyers and having multiple buyers available is advantageous with the help of ICT.

* Using market information for sales planning: There are dozens of ICT solutions to deliver market information to small farmers, which helps in planning resources as well as sales.

* Better traceability: Commercial buyers like wholesalers and exporters find it challenging to source from smallholders, as the quality and safety standards are often compromised. ICT offers a solution through complete traceability and blockchain technology.

Agriculture e-Challenges

There are several challenges involved in marketing of agricultural produce. The literacy level among the farmers is low, there is limited access to market information, multiple channels of distribution etc. Most of the small farmers still depend on the local moneylenders who charge high rates of interest. There are several loopholes in the present legislation and there is no organized and regulated marketing system for marketing the agricultural produce. To summarise, the major challenges faced by ICT initiatives in agricultural marketing are institutions and policy implementation lags, policy and incentives, affordability, airtime, Internet café charges, irrelevant e-content, language barriers, poor infrastructure,

low transmission signals, load shedding, less awareness, local culture, information overload, information credibility, accuracy, reliability, misinformation, effective use, sustainability, optimal use, etc. (Mohammadi, 2011).

Table 3: List of Agritech Startups leveraging ICT for robust value chain in India

S.No	Name	Description/ Solutions offered
1.	SourceTrace	It offers solutions on Farm Management, Farm Advisory Services, Certification, Monitoring & Evaluation, Traceability, Supply Chain Management, Market Linkage, and Financial Services.
2.	Farm ERP	It offers solutions on Farm Management Software, Small Farm Management Software Platform, and Science based intelligent advisory solutions and services to agribusinesses, financial data management and analysis.
3.	KANCHI	It offers solutions on Farm Data Repository, Farmer Investor Service, Inventory and invoice Management of Input shops, Farm Equipment Leasing, Produce Aggregation, and Market Access.
4.	CropIn	It offers solution on complete Farm Management Solution, Risk Mitigation and Forecasting Intelligence Solution, Pack house Solution for Traceability & Compliance, CRM & Input Channel Management Solution.
5.	pay Agri	It offers solution on forward and backward linkage, Tech Driven Products (Farmer credit Appraisal, Farmer Financial Report, Inclusive Fintech Solutions, Agri AI & Expert System, Agri Decision support system.
6.	Kalgudi	It connects farmers, traders, input dealers, logistics providers, academia, institutional buyers, POs, government departments and consumers on a gratification model. Interactions such as information, help, advice, buy, sale and service happen between them solving each other's problems and benefitting together.

7.	DigiAgri	It provides holistic as well as specific solutions for all the ecosystem players of Agriculture by keeping farmers at the center.
8.	eFresh	It envisages empowering 1000 farmer producer organizations/ agripreneurs with quality agri inputs and technology solutions for crop production, market linkages and introduction of quality management systems in business operations.
9.	DeHaat™	It provides a marketplace for farmers to sell produce to large institutional buyers directly without the intervention of middlemen or commissioning agents. The company also provides last-mile connectivity for easy logistics and storage services.
10.	Crofarm	It delivers fresh fruits and vegetables to both online and offline retailers after procuring it directly from the farmers. It uses an AI-based demand prediction system to study the historical data to make its procurement. The system also helps in keeping track of the inventory by its shelf life, which sends an alert in case of an aging inventory. Further, Crofarm also uses CRM tools built on WhatsApp to manage customer interactions.
11.	AgriBazaar	It is an online platform which helps connect farmers, traders, banks, enterprises and governments. Modelled on the traditional Mandi system, the startup provides a digital platform for small farmers and merchants to directly sell and buy farm produce without the involvement of middlemen. In this case, the farmers receive payment directly in their bank accounts via e-wallet AgriPay. Apart from connecting the sellers and buyers, AgriBazaar also provides last-mile logistics support. The startup uses AL and ML to offer services such as crop advisory and credit-on-click. Looking forward, AgriBazaar aims at mapping and tagging every farm and 'becoming the Google Maps of the Indian agri-sector'.

12.	KrishiHub	KrishiHub procures fresh vegetables directly from farmers and delivers them to businesses such as restaurants, canteens, and hostels. The startup uses an AI-powered supply chain to undertake farm-to-doorstep delivery. Other services of KrishiHub include machine learning-enabled weather forecasting, precision agriculture using satellite, and regional language supported discussion forums for the farmers.
13.	NinjaCart	NinjaCart procures fresh produce from the farmers and delivers to the businesses, including Kiranas and private retailers, in 12 hours. NinjaCart uses analytics to take control of the supply chain to solve asymmetries, inefficiencies, and disorganisation of a traditional system.
14.	Samudra Network	It offers solution on FPO Digitization like, shareholder data management, inputs stock and sales tracking, shareholder crops and outputs sales tracking, FPO business and operational metrics dashboards, market network.
15.	Intello Labs	Intello Labs offering deep learning solutions to assess the quality of farm produce. It is recognized as a de-facto business for expert AI capability in solutions that satisfy real world challenges in near real time. It has invented a pioneering first-in-the-world app & equipment to test, grade and analyse the visual quality parameters of agri commodities.
16.	BigHaat	It is bringing accessibility of quality agricultural products and personalized advisory by leveraging its technology offering for farmer empowerment. It is providing a wide choice of quality inputs to farmers at their doorstep.
17.	WayCool	WayCool has adopted a tech-enabled supply chain approach, merging the physical and digital worlds for a "phy-gital" business model. The company utilizes robotic process automation, artificial intelligence, and machine learning technologies to provide value to their suppliers and clients.

18.	Ujjay	Ujjay is enabling farmers to improve their ROI by providing them a one stop solution for all their farming needs through their platform - a technology enabled platform complimented by physical presence. They are one of the fastest growing start-ups in the Agri Tech sector and one of the few companies providing end-to-end solutions to the farming community in India.
19.	KHETHINEXT	KHETHINEXT Platform enables digital agriculture transformation, and is a product of PALS AGRI eCONNECT Private Limited. This platform supports small farm holding farmers to reduce their cultivation costs, connect with financial institutions, obtain higher remunerative prices and improve their crop productivity through virtually connecting with the rest of the agriculture ecosystem, like input agencies, financial institutions, produce buyers, agriculture experts, policy makers and government extension officers.

Suggestions for Effective ICT Application

Many stakeholders who are part of the agri value chain are already using ICT to streamline and enhance their marketing functions, ranging from using social networks to complex customer management tools (Jensen, 2007). A few suggestions for effective application of ICT are -

- Ease of access to Portals - consumer friendly
- Up-to-date content and coverage
- Layout design and consistent themes
- Easy navigation and higher interactivity
- Access through multiple media
- Higher use of non-textual information

- Multiple local/vernacular language
- Low cost of transactions
- Effective linkage with extension techniques

Conclusion and Way ahead

Agriculture contributes significantly to the Indian economy. ICT can revolutionize agriculture in many ways. ICT projects are yet to make any breakthrough in agricultural information dissemination and other areas. Deployment of ICTs needs to be stressed more. ICT for agricultural projects needs to be compared and evaluated precisely. Robust and economical mobile infrastructure is imperative for the exchange of vital information between farmers and service providers. Further, the use of smartphones and tabs for information dissemination is more efficient and tailored for the users as it facilitates in installing software applications for getting advanced risk mitigating strategies such as early warnings and advisory information. It also helps in integrating the supply chain with GPS which provides mapping functionality.

Thus, ICT innovation empowers farmers by facilitating timely access to localised and personalised information for greater control of their production, risks and thus market their produce to the identified market opportunities. It is the need of the hour to obtain apposite information through ICTs and to deploy advanced ICTs in agriculture, one of the indispensable sectors in our country. It is a well-known fact that ICT can revolutionize agriculture in many ways. There is a need to strengthen the physical infrastructure (storage, logistics), regulatory mechanisms (APMC Act, agri input/marketing licenses); and socio-economic conditions (financial inclusion, aggregation). A professionally managed ICT platform can bring the various pieces of the agri value chain together and act as a catalyst for agricultural growth. The solutions must be mobile based approach to maximize on-ground adoption and impact. Effective use of social media in Supply Chain Management is necessary for the benefit of all stakeholders. The high potential for ICT integration in agribusiness value chains must be tapped.

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Upscaling Potential Sustainable Agricultural Practices as Carbon Sequestration and GHG Emission Reduction Options

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Abstract

According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), India's total Green House Gas (GHG) emissions in 2014 were 3,202 million metric tons of carbon dioxide equivalent (MtCO2e), totalling 6.55 per cent of global GHG emissions. India is the world's fourth-biggest emitter of carbon dioxide after China, the US and the EU. In India, about 68.7 per cent of GHG emissions come from the energy sector, followed by agriculture (19.6%), industrial processes (6%), land-use change and forestry (3.8%), and waste (1.9%). The global technical GHG mitigation potential from agriculture is estimated to be 5.5-6.0 Gt CO2-eq/year, by 2030. This can be achieved by the adoption of the best available management practices related to sustainable land use, good agronomic practices, soil and water management practices, agroforestry, etc. In the COP26 summit held at Glasgow, 2021, India has pledged to adopt a net-zero emissions target by 2070. In this context, academia and research organizations are undertaking research on carbon sequestration and GHG emission mitigation. The results indicate that there are huge opportunities for investment through carbon financing in agriculture to upscale the good practices to reduce the atmospheric greenhouse gas emission through carbon sequestration. This review paper elucidates the important Climate smart Agricultural (CSA) technologies and practices that help in the sequestration of carbon and reducing the emission of GHGs.

Keywords: Carbon Sequestration, GHG emission reduction, CSA technologies, climate change

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Introduction

Agriculture, especially in developing countries, is one of the major contributors to Greenhouse Gases (GHGs). The sector is emitting about 13 per cent of the total global anthropogenic GHG emissions (Wang et al., 2017). India is the world's fourth-biggest emitter of carbon dioxide after China, the US and the EU (The Economic Times, 2021). According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), in 2014, India's total GHG emissions were 3,202 million metric tons of carbon dioxide equivalent (MtCO2e), which was 6.55 per cent of global GHG emissions. In India, about 68.7 per cent of GHG emissions come from the energy sector, followed by agriculture (19.6%), industrial processes (6%), land-use change and forestry (3.8%), and waste (1.9%).

In agriculture, the majority of GHG emissions are generated from the production and use of agricultural inputs such as water, fertilizers and pesticides, farm machinery, soil disturbance, residue management and irrigation (Prasad et al, 2021). GHG emission in India has increased by 161 per cent over 50 years from 14.81 TgCE/year (0.12 tCE ha-1yr-1) in 1960 to 38.71 TgCE/year (0.28 tCE ha-1yr-1)by 2010. Further, in India, the total emissions from major crops, i.e. rice, wheat, maize, cotton and sugarcane (these crops constituted 80% of total crop emission) and livestock, i.e. cattle, buffalo, pig, sheep and goat (constituted 99% of total livestock-related emission) CO2e were 451 Megatonnes (Mt) in 2012. Under the Business As Usual (BAU) scenario with no mitigation, projected GHG emissions from these crops and livestock species would be 489 MtCO2e in 2030, while emissions under the mitigation scenario would be 410 MtCO2e, offering a technical mitigation potential of about 78.67 MtCO2e per year. About 18 per cent of the total emissions from agriculture could be abated by adopting technically feasible mitigation measures (Sapkota et al, 2019). In addition, the intensive cultivation without caring for the sustainability of the system has resulted in the common problem of reduced Soil Organic Content (SOC) stock. The SOC has depleted considerably in the top 20 cm of the Indian soil horizon due to intensive farming practices and unsustainable agricultural approaches (Meena et al, 2020). The SOC of soils in the Indian agroecosystem has depleted severely, ranging from often <1 g kg^{-1} or barely 10 to 15 Mg C ha^{-1} to 40 cm depth (Lal, 2015).

To minimise the GHG emissions, India ratified the Paris Agreement a year after the submission of its Intended National Determined Contribution (INDC). Its NDCs for the period 2021 to 2030 are to reduce the emissions intensity of GDP by 33-35 per cent by 2030 below 2005 levels, to create an additional (cumulative) carbon sink of 2.5-3 billion tonnes of carbon dioxide (CO2) equivalent through additional forest and tree cover by 2030. In the Conference of Parties (COP26) summit held at Glasgow, Scotland in 2021, India has also pledged to adopt a net-zero emissions target by 2070. Further, to achieve net-zero emission by 2070, the country has made five major commitments, such as instalment of non-fossil energy capacity to 500 GW by 2030, ensure economy's carbon intensity down to 45 per cent by 2030, ensure 50 per cent of its energy requirement through renewable energy by 2030 and reduce 1 billion tonnes of carbon emissions from the total projected emissions by 2030 (India Today, 2021 and The Print, 2021).

To better adapt to climate change, there is a need for investment in sectors vulnerable to climate change, particularly agriculture, water resources, the Himalayan region, coastal regions, health and disaster management (Sah and Devakumar, 2018).

The global technical GHG mitigation potential from agriculture by 2030 is estimated to be 5.5-6.0 Gt CO2-eq/year. This can be achieved by the adoption of the best available management practices related to land use and soil. Sustainable land and water management practices provide opportunities for carbon sequestration. This can be done through adopting good agronomic practices, nutrient and water management, land use practices etc.

To make agriculture carbon smart, the adoption of climate-smart agricultural/livestock technologies and good practices is essential. It will also help to (1) sustainably increase agricultural productivity and incomes to meet national food security and development goals, (2) build resilience and the capacity of agricultural and food systems to adapt to climate change, and (3) create opportunities to mitigate emissions of Greenhouse Gases (GHGs) and increase carbon sequestration. These three conditions (food security, adaptation, and mitigation) are referred to as the "triple win" of overall Climate Resilient Agriculture (CRA) (Rao et al, 2016). The "technical potential" of agricultural soil to absorb carbon ranges from 3 to 8 gigatons (billion metric tons) of CO2 equivalent a year for 20 to 30 years, enough to close the gap between what is achievable with emissions reductions

and what is necessary to stabilize the climate (Das and Avasthe, 2015). Research studies indicate that agriculture provides ample opportunities for sequestration of carbon and minimising the emissions of GHGs.

The review was carried out with the following objectives.

- To identify the good agricultural technologies and practices that help in the sequestration of carbon and reducing the emission of GHGs.
- To assess the potential of these technologies and practices in terms of carbon sequestration and GHG emission reduction potential.
- To suggest the way forward for upscaling of potential carbon sequestration and GHGs emission reduction technologies and practices in agriculture.

Materials and Methods

Data Collection Method

The data and information relating to Climate Smart Agricultural Technologies and practices that played a major role in Carbon Sequestration and reducing GHG emissions were collected through a literature review. A total of 30 published materials including research papers, reports and online news articles were reviewed.

Geographical context

The research papers reviewed on carbon sequestration and GHG emission reduction were restricted to India as the major objective of this review paper is to assess the CSA technologies and practices that played a major role in carbon sequestration and GHG emission reduction in agriculture in India.

The following theme areas were used for literature review such as Zero tillage, Crop Residue Burning, Carbon Farming, Soil Health Management, Bio Char, Integrated Farming System, Organic Amendment, Organic Agriculture, Crop Production, Climate Resilient Village and COP26.

Results and Discussion

The present review has identified a total of 13 most important agricultural innovations, technologies and practices to reduce GHG emissions and enhance carbon sequestration in India.

1. Precision Nutrient Management Technologies (PNMTs)

It is found that agriculture in India consumes high N. Adoption of precision nutrient management technologies by farmers has the potential mitigation of 17.5 MtCO2e per year and cost-saving of Rs. 6500 per tCO2e. However, the results vary from state to state, for example, Uttar Pradesh has GHC mitigation of 3.15 MtCO2e per year by adopting PNMTs, followed by Andhra Pradesh (2.04 MtCO2e), Maharashtra (1.72 MtCO2e) and Punjab (1.5 MtCO2e). States such as Gujarat, Karnataka, Madhya Pradesh, Haryana, Bihar, Rajasthan, West Bengal and Tamil Nadu have GHC mitigation between 0.7 and 1 MtCO2e per year, and it is less than 0.5 MtCO2e per year in other states (Sapkota et al. 2019).

2. Use of legumes for long term

As there is low organic content in the Indian soil, the possibility of on-farm generation of legume biomass (horse gram; Macrotyloma uniflorum (Lam.) by using off-season rainfall and incorporating them in the soil was examined in two field experiments involving sorghum and sunflower from 1994 to 2003. The effects of this incorporation were assessed on crop yields and soil properties for 10 years, together with fertilizer application. Horsegram biomass ranging from 3.03-4.28 t ha-1 year-1 (fresh weight) was produced and incorporated in situ under different levels of fertilizer application. With biomass incorporation, mean organic carbon content improved by 24 per cent over fallow. Microbial biomass carbon improved by 28 per cent. Long-term biomass incorporation and fertilizer application resulted in the build-up of soil nutrients compared with the fallow plots (Venkateswarlu et al. 2007). The above practices would reduce the external application of inorganic fertiliser and thereby mitigate the GHG emission.

3. Zero tillage (ZT)

Zero tillage has both climate change mitigation and economic benefits. Adoption of zero tillage in rice, wheat, maize, cotton and sugarcane would provide abatement of about 15

MtCO2e per year in India and also save Rs.4200 per tonne of CO2e abated (Sapkota et al. 2019). In Haryana, ZT based wheat production reduces GHG emission by 1.5 Mg CO2-eq ha-1 season-1. Farmers can save approximately USD 79 ha-1 (20%) in terms of total production costs and increase net revenue by about USD 97.5 ha-1 (28%) under ZT compared to Conventional Tillage (CT). ZT based wheat production has the mitigation benefits of 1.5 Mg ha-1 season-1 as this reduces CO2 emission. This means adopting ZT to about 1 million ha under wheat production in Haryana will reduce GHG emission of about 1.5 million tonnes of CO2 equivalent in a season and it would save about USD 79 million per wheat season through a reduction in the cost of production. This will bring approximately USD 97.5 million additional net revenue to wheat farmers in Haryana (Aryal et al, 2015). Considering the research results, if the Zero Tillage is scaled to all the wheat-producing areas (i.e. around 29 million ha), it has the potential to reduce 43.5 million tonnes of CO2 equivalent in one season.

Further, with the conversion of rice-wheat systems of India to no-tillage, the C sequestration potential is estimated to be 44.1 Mt C over 20 years. Similarly, adopting no-tillage practices in maize-wheat and cotton-wheat production systems would yield an additional 6.6 Mt C. This offset is equivalent to 9.6 per cent of India's annual greenhouse gas emissions (519 Mt C) from all sectors (excluding land-use change and forestry) (Grace et al, 2012). Zero tillage may further help farmers to save 70 to 90 litres of diesel per ha, thereby helping them save USD 40-50 per ha (Wang et al, 2016).

4. Water management

Improved water management in rice in India offered mitigation of ca. 12 MtCO2e per year with a cost saving of Rs. 770 per tonne of CO2e saved. There is also a regional variation, in the case of water management in rice. The highest mitigation potential was found in Andhra Pradesh (3.81 MtCO2e) followed by Tamil Nadu (1.81 MtCO2e), Orissa (1.54 MtCO2e) and West Bengal (1.23 MtCO2e). In Karnataka, Uttar Pradesh, Assam, Punjab and Bihar, this option would have the potential to save between 0.42 and 0.84 MtCO2e emissions, whilst the remaining states would deliver less than 0.25 MtCO2e savings (Sapkota et al. 2019).

5. Micro irrigation and Laser levelling

Other water management options such as sprinkler, or micro-sprinkler irrigation and fertigation together, offered a technical mitigation potential of ca. 5.5 Mt CO2e. However, these measures require large capital investment by farmers and cost more than Rs. 27000 per t CO2e abated (Sapkota et al. 2019). Adoption of laser levelling in rice-wheat areas would result in mitigation of ca. 4 MtCO2e per year at a nominal cost of Rs. 1940 per t of CO2e saved without considering additional yield benefits, and Rs. 21947 saving per t CO2e abated when additional yield benefits were considered.

6. Stopping residue burning

Around 500 Mt of crop residue is generated in India every year. Most of the burning takes place in the states of Uttar Pradesh, Punjab and Haryana. About 25 per cent of the crop residue is burned on the farm. Burning of 98.4 Mt of crop residue has resulted in the emission of nearly 8.57 Mt of CO, 141.15 Mt of CO2, 0.037 Mt of SOx, 0.23 Mt of NOx, 0.12 Mt of NH3 and 1.46 Mt NMVOC, 0.65 Mt of NMHC, 1.21 Mt of PM during 2008-2009, of which, CO2 is 91.6 per cent of the total emissions. The remaining 8.43 per cent consists of 66 per cent CO, 2.2 per cent NO, 5 per cent NMHC and 11 per cent NMVOC (Jain et al, 2015). There is an alarming increase in air pollution in Delhi and nearby cities due to crop burning in Uttar Pradesh, Haryana and Punjab state, in addition to the deteriorating soil fertility year on year. Crop residue burning touches many sectors such as the environment, agriculture, economy, social aspects, education and energy. Rice and wheat contribute 70 per cent of the crop residue. The labour shortage and short time availability between two consequent crops lead to the burning of crop residues (Bhuvaneshwari et al, 2019). About 2 Mt CO2e could be abated every year by stopping residue burning at a small cost of Rs. 680 per t CO2 for residue management.

7. Biogas production

Improved manure management through the establishment of large biogas plants has the potential to save 9.3 MtCO2e per year. This option involved large capital investment.

8. Organic farming

Most of the areas in India are under rainfed agriculture (70%) where a limited amount of inorganic fertiliser is used for crop production. Only 0.77 million ha of land is fully under organic farming (Patle et al, 2014). Organic farming uses 20 to 50 per cent less energy than conventional agriculture. Organic farming has great potential to improve soil carbon storage. Niggli et al. (2009) estimated that the global average sequestration potential of organic farming is about 0.9-2.4 Gt CO2 year-1, which is equivalent to an average sequestration potential of about 200 to 400 kg C ha-1 year-1 for all crop-lands. Results of twelve-year long term experiments of ICAR Research Complex for NEH Region, Umiam indicated that long term adoption of organic production practices significantly increases the soil organic carbon and carbon stock and reduces the bulk density as compared to an inorganically managed field. For example, the carbon sequestration of Rice-Carrot was 0.55 Mg ha-1year-1, Rice-Potato 0.61 Mg ha-1year-1, Rice-French bean 0.65 Mg ha-1year-1, Rice-Tomato 0.63 Mg ha-1year-1 (Dutta et al. 2017).

9. Biochar

Application of biochar has also been reported to reduce a considerable amount of methane and nitrous oxide emission from the agricultural field due to its priming effect on the soil. Most of the reported benefits are confined to laboratory and field trials at the institute level; widespread adoption of biochar on farmer's fields is still lacking (Gupta et al, 2020). Biochar production and application to soil have several benefits such as improvement of soil physical properties, improved retention and availability of soil nutrients, improved biological activity and mitigation of emission of GHGs.

The estimated biochar production potential from different crop and woody residues in India is 162 and 32.7 Mt yr-1, respectively and the combined C sequestration potential by incorporation of biochar produced from crop and woody residues into the soil is 95.0 Mt yr-1. ICAR-Central Research Institute for Dryland Agriculture (CRIDA) has developed a biochar kiln with operational procedures and standardization of biochar production protocols from different residues and biochar characterization methods and their properties. On average, the production cost of one kg of biochar from castor and cotton stalk was estimated to be Rs. 14.0 and Rs.13.0, respectively. The results of the

field trials of Pigeonpea (PRG 158) showed that the alternate year application of either pigeon pea stalk biochar @ 6 t ha-1 with the recommended dose of fertilizers (50-20-00 kg N, P2O5, K2O ha-1) or cotton stalk biochar @ 3 t ha-1 with the recommended dose of fertilizers produced a higher pigeon pea grain yield of 1484 and 1400 kg ha-1, respectively, compared to control (454 kg ha-1). Moreover, CRIDA has estimated that 7.8 Mt of biochar could be produced annually from castor, cotton and pigeon pea crop residue by using CRIDA biochar kiln. Based on the total carbon percentage in the respective biochar, it is estimated that its application can sequester about 4.6 Mt of total carbon annually in soil, making it a carbon sequestering process (Venkatesh et al. 2018). Further, it is estimated that the mitigation potential of biochar is up to 12 per cent of current anthropogenic CO2 emissions (net emissions of GHGs could be reduced by 1.8 Gt CO2 -C equivalents yr-1) (Woolf et al. 2010).

10. Farmyard manure in rice-wheat cultivation

Continuous cultivation of rice and wheat, without application of organic inputs, significantly depleted total C content (by 39-43%) compared with treatments involving the addition of organic amendments. For example, application of farmyard manure (FYM @ 7.5 t ha-1), paddy straw (PS @ 10 t ha-1) and green manure (GM @ 8 t ha-1) along with inorganic fertilizer resulted in a significant increase in the non-labile C fraction resulting from both organic and inorganic amendments. In addition, an increase in the yield of kharif rice was observed as a result of the addition of these organic amendments. The amount of C sequestered under NPK and FYM was 2.47 Mg per ha after 25 years of cropping pattern of rice-wheat cultivation. Also, in the untreated cropping system, there was a loss of 5.6 C after 25 years. Application of FYM, paddy straw and Green Manure as a supplement with NPK increased organic C and uptake of plant C (Ghosh et al, 2012). In India, about 10 million ha of area is under rice-wheat cultivation i.e. rice is planted with wheat after the rice harvest (Shahane et al. 2020). Hence, there is a huge potential to have maximum carbon sequestration through the application of FYM, Paddy straw and Green Manure along with inorganic amendments in the rice-wheat cropping system of about 10 million ha.

11. Agroforestry

As per the Forest Survey of India (FSI), in 2019, the total forest and tree cover of the country is estimated to be 24.56 per cent (807276 sq km). It has been estimated that the total carbon stock in the forest is 7,124.6 million tonnes, with an increase of 42.6 million tonnes compared to the 2017 assessment. The annual increase is estimated to be 21.3 million tonnes, which is 78.1 million tonnes CO2 eq. Soil Organic Content (SOC) represents the largest pool of carbon stock in forests with 4004 million tonnes (56%) of the total forest carbon stock of the country (GoI, 2019). Forestry has been recognized as a means to reduce CO2 emissions as well as enhance carbon sinks. The total carbon sequestration potential of global croplands is about 0.75-1.0 Pg/yr or about 50 per cent of the 1.6-1.8 Pg/yr lost due to deforestation and other agricultural activities (GOI, 2019).

Practices that reclaim the productivity of degraded lands such as plantations with multipurpose tree species and bioenergy crops can enhance soil carbon sequestration and substitute fossil fuels to some extent. The technical mitigation potential of restoring degraded land in India would be ca. 7 MtCO2e per year. (Sapkota et al,2019). However, it needs additional costs and incentives for the farmers to adopt tree-based agriculture. In India, the carbon sequestration potential of the agroforestry system is estimated between 0.25 - 19.14 and 0.01 to 0.60 Mg C/ha/yr for tree and crop components, respectively. The contribution of agroforestry in soil carbon sequestration varied between 0.003 to 3.98 Mg C/ha/yr. (Dhyani and Handa 2013, Dhyani et al, 2016).

Agroforestry provides a unique opportunity to combine the twin objectives of climate change adaptation and mitigation. India has several agroforestry systems, which differ from region to region. Agroforestry systems and alternative land-use systems for India had estimated a sequestration potential of 68-228 MgC/ha. However, the magnitude of carbon sequestration from forestry activities would depend on the scale of operation and the final use of wood. Maikhuri et al. 2000 estimated species wise annual carbon sequestration potential of planted tree species on abandoned agricultural land (3.9 t/ha/yr) and degraded forest land (1.79 t/ha/yr).

- The highest carbon sequestration was found for Alnus nepaliensis 0.256 tC/ha/yr and Dalbergia sissoo 0.141 tC/ha/ yr intercropped with wheat and paddy.

- In an agri-silvicultural system, Dalbergia sissoo at age 11 years was able to accumulate 48-52 t/ha of biomass.

- In a Poplar based agroforestry system, trees could sequester higher soil organic carbon up to 30 cm depth during the first year of plantation (6.07 t/ha/yr) than in subsequent years (1.95-2.63 t/ha/yr) with greater soil carbon storage in sandy clays than loamy sand. Poplar (Populus deltoides) is a fast-growing industrial softwood (plywood/plyboard, paper and pulp, match stick, etc.) recommended for growing in association with field crops in the Indo-Gangetic plains in India (Sharma et al, 2016).

Farm forestry or agroforestry systems have the potential to sequester carbon in a short period. Leucaena and eucalyptus-based plantation systems with closer spacing are found in several districts of Andhra Pradesh. It was found that farm forestry system with Leucaena and eucalyptus has the potential to sequester about 62 Mg/ha when planted at 1 × 1 m and 3 × 2 m. Also, the carbon sequestration potential of farm forestry system with eucalyptus was found was 34 Mg/ha for a rotation of 4 years when planted at 3 × 0.75 m and 7 × 1.5 m (Prasad et al, 2012).

12. Livestock sector

Green fodder supplements and increased concentration in the rations of ruminants would have the potential to mitigate ca. 3.4 MtCO2e per year, although adoption of these measures would incur an additional cost. These options, particularly green fodder supplements, appeared to be highly cost-effective if additional yield benefits were taken into account (Sapkota et al, 2019).

13. Solar pumps

India has an estimated 15 million electric tube wells and requires 1,68,611 million units of electricity worth Rs.1,19,294 crore (2014-15). Hence, solarizing all these electric tube wells with solar pumps will reduce the GHG emissions.

Conclusion

Evidence indicates that several technologies and practices are available to sequester carbon and mitigate GHG emissions in the Indian context. However, these technologies are crop and location specific. Further, these are not implemented at scale due to lack of funding. Hence, there is a need for adequate funding support to scale up these technologies/ practices. Further, facilitating policy is essential to harness investment in the agricultural sector through carbon financing.

Recommendations

1. There is a scope for documentation of the potential CSA technologies and practices and storing them in a common domain for the use of various stakeholders. National institutes like the Indian Council of Agricultural Research (ICAR) may act as a knowledge domain for potential CSA technologies and practices.

2. Policymakers may provide substantial funds to public and private extension systems to identify potential technologies, prioritise and promote them at the field level.

3. Extension advisory service providers may promote the identified potential CSA technologies and practices in their project areas and sites. This will help farmers to adopt sustainable technologies, reduce the risks of climate change and minimise the emission of GHGs into the atmosphere.

4. The Government may organise regular stakeholders meetings with international carbon financing agencies to route carbon finance for upscaling potential technologies and practices.

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Is Pest Management getting enough attention in the District Agricultural Development Plan?

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Abstract

Compared to any other means of crop losses, the damage caused by the insect pests, diseases and recently the non-insect pests is very serious. Pest Management has not received the attention it merits, in the District Agricultural Development Plan (DADP). The pest and disease management strategies adopted by the farmers are not philosophically based on scientific and rational advisories of the experts, in most cases, especially in cases of pests of serious concern. Many a time, even the advisories by the experts cease to be real-time and location specific, because of the time lag in delivery system or dissemination through unauthorized and unsolicited channels of communication. This policy paper recommends a renewed and vital strategy for addressing this issue and changing the agricultural situation at the district and block level, as pest management has not received enough attention in the District Agricultural Development Plan (DADP).

Keywords: Pest Management, District Agricultural Development Plan

Introduction

Agriculture in developing countries suffers most because of the high incidence of various pests and diseases. In India, the annual production losses due to pest and disease infestation are projected to be 20-30 per cent, and in monetary terms, it translates to around US $42.66 million (Sushil, 2016). Chemical control of pests is becoming a common practice in agriculture. There are more than a thousand pesticides, of both chemical and biological nature, used around the world, to minimize crop losses. The per hectare consumption of pesticides increased by nearly 50 per cent, from 0.20 kg/ha in 2009-10 to 0.36 kg/ha in

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2019-20 (FAO, 2021). The per hectare use of pesticides in India is much lower as compared to other countries like China (13.06 kg/ha), Japan (11.85 kg/ha), Brazil (4.57 kg/ha) and other Latin American countries (FAOSTAT, 2017). Within India, there is a lot of variation in the use of chemical pesticides among different states. The per hectare consumption of pesticides was highest in Punjab (0.74 kg/ha), followed by Haryana (0.62 kg/ha) and Maharashtra (0.57 kg/ha) during the year 2016-17, while the consumption levels were lower in Madhya Pradesh (0.03 kg/ha), Rajasthan (0.05 kg), Karnataka (0.10 kg/ha) and Bihar (0.11 kg/ha) (Subash et al., 2017). Sikkim became India's first '100 per cent organic state'. Today, all farming in Sikkim is carried out without the use of synthetic fertilizers and pesticides, providing access to safer food choices and making agriculture a more environment-friendly activity.

There is a strong perception that chemical pesticides are effective as they control pests effectively and are easy to adopt. However, they also leave a serious negative impact on the environment. Excessive use of pesticides may lead to the destruction of biodiversity. Many birds, aquatic organisms and animals are under the threat of harmful pesticides for their survival. Pesticides are a concern for sustainability of the environment and global food security as they pose a serious impact on the soil and environment, water quality, development of insect resistance and increase in toxic residue through the food chain and animal feed thus increasing health problems and many more (Subash et al., 2017). About 44 per cent of the global population working on farms i.e. nearly 860 million farmers and agricultural workers are poisoned every year due to exposure to pesticides (PAN, 2020). Therefore, the use of biopesticides to control pests is becoming more important and the preferred method of pest control these days, over synthetic pesticides. They are also turning out to be equally effective in pest control and with a diverse mode of action which helps to address the above listed problems.

Biopesticides are pest management agents and chemicals derived from natural sources such as bacteria, fungi, viruses, plants, animals and minerals. Presently, biopesticides cover only 2 per cent of the total pesticide usage globally (Kumar & Singh, 2015) and in the case of India, it comprises of 5 per cent of the total pesticide market (Kumar et al., 2019). The biopesticide industry in India is undergoing a rapid change due to the change in consumer preferences as they are less or not toxic and environment friendly. The biocontrol measures play a prominent role in organic farming and Zero Budget Natural

Farming (ZBNF). Questions over the feasibility of organic farming and ZBNF have been raised on whether these approaches will be able to control pests and diseases effectively and whether the yield of crops will remain stable if not negative. The decline in food production would create a food shortage that would ultimately result in increased prices of food commodities. Hence, we see an immediate need to put a further impetus on an Integrated Pest Management (IPM) approach to sustain the production and generate sustainable economic returns to the farmers. The point that arises here is to what extent the farmers will be ready to shift from the prevailing chemical pest control measures to the IPM approach.

A pilot study of the District Pest Management Plan (DPMP) was conducted during the period 2016-19 by the National Institute of Agricultural Extension Management (MANAGE) in association with the National Institute of Plant Health Management (NIPHM) on three major crops in Warangal rural and urban districts of Telangana. After two years of implementation of the programme with IPM interventions, an impact evaluation study was conducted. The study revealed that majority of the respondent farmers had high level of knowledge (63.33%) and highly favourable attitude (65.00%) towards the use of IPM technologies. Further, the study also revealed that there was a positive effect on adoption of IPM technologies among the farmers in terms of decrease in the number of chemical sprays (45.00%), and increase in the use of physical control (30.00%), cultural control (70.51%) and biological control (71.33%) measures of pest and disease management. At the same time, the study found that the yield in DPMP implemented villages had increased by 36.67 per cent as compared to the yield in non-implemented villages. If the concerted efforts in the pilot study can be replicated on a large scale, the overarching benefits of adopting IPM practices over chemical control methods can be observed. Hence, the district pest management plan should become an essential component in the district agricultural development plan at the district level (Shirur et al, 2020).

MANAGE as a pioneer national institute in agricultural extension is playing a major role in training the agri-input dealers and agricultural graduates as they are one of the major sources for providing agro-advisory services to the farmers. However, the erstwhile existing input dealers lack technical knowledge about agriculture, pests and the chemistry of pesticides. This has led to the recommendation of non-label chemicals and overdose

causing the destruction of the environment and natural ecosystems. Hence, the Government of India (GOI) initiated a programme namely, 'Diploma in Agricultural Extension Services for Input Dealers (DAESI)' where MANAGE is implementing and monitoring the programme to enhance the technical competency of input dealers. The one-year diploma programme with theory and practical visits has helped the input dealers to develop sound technical knowledge on crop pests, diseases and their management and safe use of pesticides. Agri-Clinics and Agri-Business Centers (AC&ABC) is another major programme implemented by MANAGE, which enables graduates from agriculture and allied sectors to start agri-clinics and agro advisory services to supplement the efforts of public extension system. Agri-Clinics and Agri-Business Centers are envisaged to provide expert advice and services to farmers on crop production and protection activities. This would lead to enhance the productivity of crops and animals and ensure increased income to the farmers.

There are several voices urging for a convergence platform to bring together different policies and plans executed at different levels by various agricultural and allied sector departments. Presently the Comprehensive District Agricultural Development Plan (CDAP - RKVY), Strategic Research and Extension Plan (SREP-ATMA), District Credit Plan (DCP), and District Irrigation Plan (DIP - PMKSY), District Profile of KVKs and Detailed Project Reports (DPR) of Watershed Programmes etc. are in operation in a majority of districts of the country. It is surprising to note that enough emphasis is not laid on the pest management plan to tackle the pests and diseases affecting the crops in a district. Many a time we see sudden outbreak of pests and diseases in a locality, affecting the farmer adversely. Mite infestation in coconut a few years ago, the fall armyworm in maize in 2018-19 and the locust swarming across many states in 2020 are a few incidences to recall. Therefore, the district pest management model and its elements need to be integrated into the district planning by the administrators. The most appropriate way to implement the pest programme is its integration in the DADP developed by ATMA and its participating stakeholders. The existing manpower and machinery will take up the timely operations depending on the weather, cropping pattern and the nature of farming operations.

The figure 1 shown below illustrates the District Pest Management Programme (DPMP) model developed and depicted based on DPMP implementation in rural and urban districts of Warangal. This model is a cyclic model which guides the officials from pre-sowing

precautions to pre-pest affected management practices, post-pest affected management practices and post-harvest cleaning measures. The model broadly laid on 7 steps 1) Survey and surveillance 2) Pre-sowing plans 3) Sowing operations and crop standing season 4) Post sowing plans 5) Problem analysis 6) Evaluation and 7) Feedback as an effective approach to pest and disease management in a district. The same can be recommended to other districts with need-based and situational modifications.

A pest in one field is a threat to the other fields in a village or an agro ecological region. Since there are staggered sowings in an agro-ecosystem, that led to the spread of pest and disease incidence to other fields in which the crop stages are vulnerable to pests and diseases. Seed treatment with biopesticides should be promoted by the departments working at the block and village level to safeguard against seed-borne diseases.

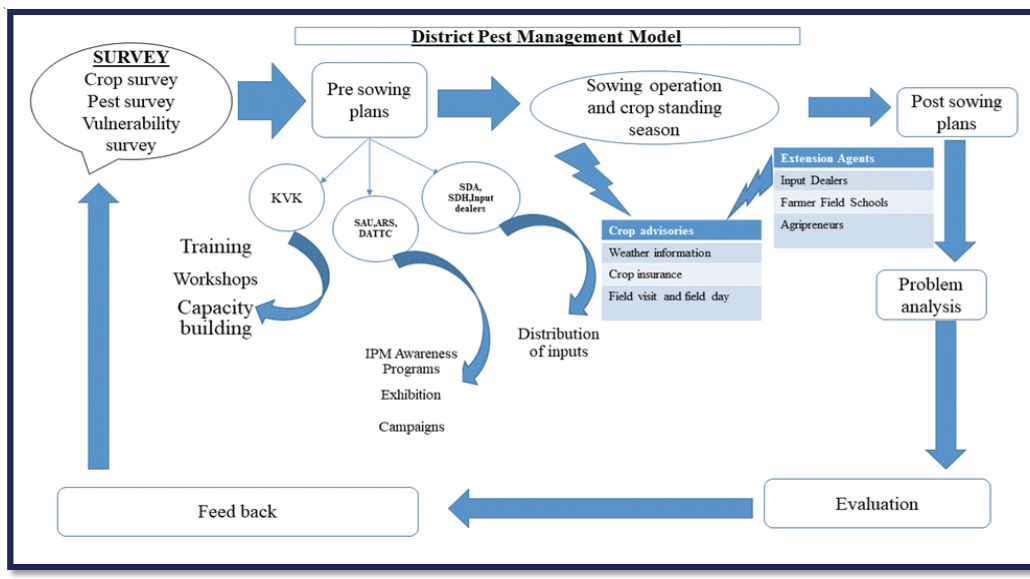

Figure 1: District Pest Management plan (Shirur et al, 2020).

The vaccination schedule for livestock should be formulated in advance to combat seasonal diseases. Farmers should be educated and trained, to improve their awareness of crop insurance and livestock insurance to avoid crop failures and losses because of the unpredictable spread of epidemic and endemic pests and diseases like the incidence of fall armyworm. Frequent inspection of the field for checking the pest epidemiology and

taking precautionary measures for their control should be taken up by the departments with regular follow-up to review the incidence of pests and diseases.

Doubling Farmers Income Committee (MAFW, 2017) put an onerous responsibility on MANAGE to facilitate the convergence of extension agencies between multitudinous institutions and to develop a platform for knowledge convergence and solutions for various challenges plaguing the agricultural extension and advisory service delivery system. Every individual institution has contributed in its own way in meeting the expectations of the farmers. However, this is not appreciated as these institutions work in isolation. Therefore, there is a strong case for realizing the complementary results by promoting effective collaboration among all the institutions to capture their knowledge. There is also need for functional strategies to realize sharing, learning and networking for innovation.

The required support to implement IPM practices should come, with sharing of technical expertise, from research and extension agencies either involved directly or indirectly in the agriculture sector at the district level, like SAUs, KVK and ATMA. The biopesticide and biofertilizer production units managed by both public and private institutions can be supported by the KVKs and training institutes of the district through vocational trainings, on the production of biopesticides, biofertilizers and vermicompost, for farmers. Extending handholding support to the trained AC & ABC graduates through National Bank for Agriculture and Rural Development (NABARD) and the National Horticultural Board (NHB) would help them to establish production units at the district level. In turn, KVK and the State Department of Agriculture (SDA) can take advantage of purchase and supply to the farmers at reasonable price to minimize the gap between supply and demand. Hence the State Department of Agriculture and ATMA should take lead in converging all the line departments and private agencies working at the district level to have a dynamic pest management plan.

In view of the problems and challenges discussed, major policy recommendations are given below for an effective pest management strategy for a district, in the District Agricultural Development Plan (CDAP - RKVY).

Policy Recommendations

* District Pest Management Plan should not be confined to agriculture only, as in some districts allied activities like animal husbandry, poultry and fisheries exist as major activities. Hence DPMP should converge all the line departments for the preparation of consolidated pest and disease management strategies to enhance productivity and thereby ensuring returns to the farmers.

* Survey exercises suggested in the district plan should not be confined to mere data collection on the crop pest and disease incidence. The data enumerators should be professionally trained on the predisposing factors conducive for the emergence of a particular pest and its severity.

* As the microclimatic conditions, soil type, irrigation pattern and cropping pattern varies within the district and block, the block/sub-block, specific action plan based on weather conditions should be considered for pest and disease management.

* Agro-advisory information generated through limited data from the agro meteorological observations in the district should be fed into the reliable model so that the weather forecasting is accurate.

* Climate change has made India's monsoons more erratic that has led to a delay in sowing patterns and puts an enormous pressure on mechanization. Hence, custom hiring centers with trained technicians to operate the machinery should be promoted at the block level.

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Analysis of Constraints faced by State Agricultural Management and Extension Training Institutes (SAMETIs): An Empirical Study

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Abstract

State Agricultural Management and Extension Training Institutes (SAMETIs) are the autonomous institutes to look after the extension and training related aspects of middle, grassroot level extension functionaries and also farmers. The present paper discusses the constraints faced by various SAMETIs in terms of Infrastructure, Human Resources, Financial Matters, Administrative aspects, and constraints in operating the Central Sector Plan Schemes like Diploma in Agricultural Extension Services for Input Dealers (DAESI), Skill Training of Rural Youth (STRY), further also in the conduct of the Post Graduate Diploma in Agricultural Extension Management (PGDAEM). A structured questionnaire was administered and data collected through a mailed survey from about 31 SAMETI Directors across the country. Weighted averages were calculated to know where a particular constraint falls on a continuum of 1 to 5 (Strongly Disagree to Strongly Agree). The results of the study implied that there are significant measures which may be taken to improve the condition of SAMETIs to make them more vibrant and serve the farmers with vigour and passion.

Keywords: SAMETI, Agricultural training institutes, Extension Training Institutes.

Introduction

The State Agricultural Management and Extension Training Institute (SAMETI) is a State level institution which is autonomous, with greater flexibility in structure and functioning and responsible for organizing need based training programs for the project implementation

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functionaries of different line departments as well as the farming community. This is achieved through linkages with other technical and management institutions in the state to support desired training input. 'SAMETI' functions with the technical guidance of the National Institute of Agricultural Extension Management (MANAGE) (http://www.sameti.org/default1_2whissameti.htm). These institutions play a vital role in training the middle level, grass root level extension functionaries and farmers according to the geographical setup, soils and other agro-climatic conditions prevailing in the concerned regions. SAMETIs also actively implement the Central Sector Plan Schemes (CSPS) like Diploma in Agricultural Extension Services for Input Dealers (DAESI), Skill Training of Rural Youth (STRY) scheme, and also implement the Post Graduate Diploma in Agricultural Extension Management (PGDAEM) program and conduct research. Hence, SAMETIs are one of the apex bodies at the state level, looking after the agriculture related training programs, and other agriculture related work assigned by the state government.

The public extension system, represented by State departments of Agriculture and allied disciplines of the concerned state, is one of the major information sources for farmers. With ever-changing technological innovations, the dynamics of world agriculture and agricultural extension systems are changing from mere dissemination of knowledge to diversification, commercialization, sustainability and efficiency through which the successful shift from production-led agriculture to revenue-led agriculture may be achieved. To increase the revenue from different farming systems, farmers need the right information at the right time about production technology, weather and climate, market information, etc., from various sources, majorly from the public extension system. Extension functionaries of the public extension system need to be strengthened and updated with these spheres of knowledge and skills to help the farmers increase their revenues, here comes the importance of capacity building of extension functionaries.

In order to carry out different kinds of works, SAMETIs need to be equipped with adequate infrastructure facilities, adequate number of faculty and other administrative support staff, transport facilities for field visits, finance, etc. for the conduct of training. An adequate and efficient workforce ensures the quality of work. In every organization, physical resources, financial resources and human resources play a vital role in the survival, growth and development of the organization. Physical resources like Buildings, Furniture,

Computer systems, LCD, etc.; financial resources like getting timely budget, Grant-in-Aid etc; and finally above all, the most important is human resources like faculty members, administrative staff, etc. are essential for SAMETIs.

In this backdrop, the present study was carried out to elicit the constraints faced by SAMETIs and to find solutions to the constraints manifested by different SAMETIs.

Materials and Methods

A total of 32 SAMETIs were established in different states and Union Territories at different time intervals and function as apex agricultural management and extension training institutes at the state level. In this backdrop, a structured schedule was administered to all the SAMETIs spread across the country. Since the data are to be collected from Directors of SAMETIs, purposive sampling technique was employed to collect the data through the mailed survey method. Thirty-one SAMETIs responded to the survey. The SAMETIs from the following States and Union Territories participated in the survey (Table 1).

Table 1. Participation of SAMETIs Across the Country

S.No	SAMETIs of the States/ UTs	S.No	SAMETIs of the States/ UTs
1	Andhra Pradesh	17	Manipur
2	Arunachal Pradesh	18	Meghalaya
3	Assam	19	Mizoram
4	Bihar	20	Nagaland
5	Chhattisgarh	21	Odisha
6	Goa	22	Puducherry
7	Gujarat	23	Punjab
8	Haryana	24	Rajasthan
9	Himachal Pradesh	25	Sikkim
10	Jammu	26	Tamil Nadu
11	Jharkhand	27	Telangana
12	Karnataka (North)	28	Tripura
13	Karnataka (South)	29	Uttarakhand
14	Kerala	30	Uttar Pradesh
15	Madhya Pradesh	31	West Bengal
16	Maharashtra		

Questions were prepared on a 5 point continuum (1- Strongly Disagree to 5- Strongly Agree). Likert scale weighted average method was employed to know the value of each statement to identify where a particular statement falls on the 5 point continuum. The formula for weighted average is given below:

$$Weighted\ Mean = \frac{\sum_{i=1}^{n}(xi \times wi)}{\sum_{i=1}^{n} wi}$$

n = Number of terms to be averaged

wi= Weights applied to x values

Xi= Data values to be averaged.

Results and Discussion

The Infrastructural facilities like training halls, group rooms, furniture like tables and chairs, transportation facilities, electricity supply, lodging and boarding facilities, projectors, computers with internet facility and a library for trainees are very important in order to perform the day to day training activities in a smooth manner. The availability of infrastructure facilities with the SAMETIs is shown in Table 2.

Table 2. Infrastructural facilities in SAMETIs

S.No	Statement	Yes	No
1	Sufficient Number of Training halls are available for smooth conduct of Training Programs	77.42	22.58
2	Group rooms are available for group work during the training	61.29	38.71
3	Open space is available for group work	87.10	12.90
4	Adequate furniture like tables and chairs are available for the participants	87.10	12.90
5	Proper Transport facilities are available with the SAMETI	35.48	64.52
6	Regular Supply of Electricity is available	93.55	6.45
7	Lodging facilities are available in the SAMETI	67.74	32.26
8	Boarding/ food arrangement facilities are available in the SAMETI	74.19	25.81
9	Projector is available for display of films/PPTs	96.77	3.23

10	TV/LCD available	74.19	25.81
11	Sufficient number of computers are available for conduct of training	67.74	32.26
12	Internet connectivity is available	77.42	22.58
13	Library Facility is available with the SAMETI	61.29	38.71

Source: Calculated from Primary data

From the table, it is evident that 96.77 per cent of the SAMETIs possess projector facilities for displaying PowerPoint Presentations and films followed by a regular supply of electricity (93.55%), furniture like tables and chairs, open space for group work (87.10%) each, 77.42 per cent of the SAMETIs are equipped with a sufficient number of training halls and internet facility, 74.19 per cent of SAMETIs are furnished with TV/ LCD and boarding/food arrangement facilities while 67.74 per cent have lodging facility. Further, sufficient numbers of computers are available for the conduct of training in 67.74 per cent of SAMETIs, 61.29 per cent of the SAMETIs have group rooms for doing group work during the training and also have library facilities. Finally, only 35.48 per cent of the SAMETIs have proper transportation facilities, which is most important for conducting field visits for the trainees.

To sum up, the infrastructure facilities in SAMETIs are adequate and facilities like transportation, group rooms, hostel facilities, boarding arrangement need to be improved to enable the trainees and resource persons to easily commute to the training centres.

Table 3. Human Resource Constraints

S.No	Statement	SA	A	N	D	SD	Total	WA
1	Lack of sufficient staff is hampering the work	8	10	4	2	7	31	3.32
2	Coordination among the colleagues is weak	0	4	4	14	9	31	2.10
3	Lack of expertise among the employees	1	4	7	10	9	31	2.29
4	Team work among the employees is weak	1	3	2	14	11	31	2.00
5	Lack of cooperation among the employees	0	2	2	17	10	31	1.87
6	Poor work culture is hampering the productivity of the organization	2	5	2	13	9	31	2.29

SA- Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree, WA: Weighted Average

Human resources play a vital role in building any institute. Besides infrastructural facilities and financial resources, Human Resources are very valuable through which reputation, progress and development are measured. In this regard, data were collected on the constraints faced by SAMETIs in terms of manpower, as shown in Table 3.

From the above table, it is clear that out of the 31 SAMETIs studied, 18 SAMETIs fall in Strongly Agree to Agree in case of lack of sufficient staff hampering the work, which attracted a weighted average of 3.32 (Neutral to Agree) on a five-point continuum. Further, the statements - Lack of expertise among the employees and Poor work culture is hampering the productivity of the organization attracted 2.29 (disagree to neutral) each. Coordination among the colleagues is weak attracted 2.10 (disagree to neutral), Teamwork among the employees is weak attracted 2.00 (disagree) and finally lack of cooperation among the employees attracted a weighted average of 1.87 on a five-point continuum and falls in strongly disagree to disagree. These low values indicate their disagreement with the statements and show positive opinions.

Yet, the qualitative data received from the SAMETIs indicate that lack of sufficient staff is the major constraint in the SAMETIs. The study revealed that in many of the SAMETIs, the Deputy Director Positions are vacant and in a few of the SAMETIs, Accountant-cum-Clerk and Computer Operator positions are either vacant or on a contractual basis.

Table 4. Financial Constraints

S.No	Statement	SA	A	N	D	SD	Total	WA
1	Delay in getting the sanctioned budget	7	9	4	11	0	31	3.39
2	Delay in getting grants from sponsoring institutes	2	7	8	13	1	31	2.87
3	Delay in getting funds for implementing Central Sector Schemes	4	5	8	9	5	31	2.81
4	Unable to spend the budget allotted within the prescribed period	2	5	7	11	6	31	2.55
5	There are financial constraints to recruit supporting staff	4	8	5	10	4	31	2.94

SA- Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree, WA: Weighted Average

Budget is the primary element for each and every activity to be taken up by the SAMETIs. In order to conduct training, research, implement Central Sector Plan Schemes (CSPS) like DAESI and STRY, implement PGDAEM program and other extension activities, pay salaries of permanent and contractual employees, outsource works, maintenance of vehicles, hostels, furniture etc., need timely budget allocation and release of funds to SAMETI. In this connection, the study elicited the financial constraints faced by SAMETIs presented in Table 4.

From the table, it can be observed that 16 out of 31 (3.39 on 5 point continuum) SAMETIs opined that delay in getting the sanctioned budget is one of the major constraints in performing the mandated SAMETI activities and also implementing the Central Sector Plan Schemes. Financial constraints affect the recruitment of manpower which hampers the work. As shown in Table 4, this constraint attracted the weighted average of 2.94 (disagree to neutral), followed by delay in grants from sponsoring institutes with 2.87 (disagree to neutral), delay in getting funds for implementing the Central Sector Plan Schemes with 2.81 (disagree to neutral) and finally, unable to spend the budget allotted within the prescribed period with a weighted average of 2.55 (disagree to neutral). Although a majority of the constraints discussed above fall between disagree to neutral and almost near to neutral, there is a need to look into and address these constraints as the financial constraints have a cascading effect on fulfilling the gaps in physical facilities and recruitment of personnel.

Table 5. Administrative Constraints

S.No	Statement	SA	A	N	D	SD	Total	WA
1	Executive Council is meeting at regular intervals	6	10	7	7	1	31	3.42
2	General Council is meeting at regular intervals	4	8	11	6	2	31	3.19
3	Delay in construction works, if any	0	7	14	7	3	31	2.81
4	Delay in decision making	0	5	5	15	6	31	2.29
5	Delay in getting promotions	4	4	14	5	4	31	2.97
6	Subordinates are not given equal opportunity to share their views	0	4	5	13	9	31	2.13

7	Lack of support from line departments	0	9	4	12	6	31	2.52
8	Frequent transfers of staff	3	5	8	10	5	31	2.71
9	Lack of motivation and encouragement from superiors	1	2	6	13	9	31	2.13
10	Too much reporting work	0	10	9	10	2	31	2.87

SA- Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree, WA: Weighted Average

Administration is one of the important wings in any organization where recruitment, promotions, transfers and other crucial decisions are taken. In SAMETIs, as per the administrative setup, General and Executive Council meetings need to be conducted at regular intervals to take decisions on policy matters, management and administrative matters, respectively. In this regard, a majority of SAMETIs opined that Executive and General Council meetings are held regularly, which had a weighted average of 3.42 and 3.19 respectively. Delay in getting promotions attracted near to neutral (2.97) opinion. The remaining statements like Too much reporting work attracted 2.87 (disagree to neutral), Delay in construction works attracted 2.81, Frequent transfers of staff with 2.71 fell in disagree to neutral continuum. The Lack of support from line departments (2.52) attracted disagree to neutral, and finally, Subordinates are not given equal opportunity to share their views and Lack of motivation and encouragement from superiors have got a weighted average of 2.13 each and fell in disagree to neutral. These weighted average values, which are less than 3.00 indicate that these constraints may not affect the regular work in the SAMETIs.

To sum up, conducting General and Executive Council meetings at regular intervals needs to be given high importance as a review of the work done by SAMETIs and directions from the Council are necessary for future activities of SAMETIs. Other constraints like delay in promotions, frequent transfers, lack of motivation and encouragement from superiors etc. may decrease the morale of the staff, hence, the concerned authorities need to take steps to address the administrative constraints faced by SAMETIs.

Constraints in Implementing Central Sector Plan Schemes: DAESI

Agri-Input Dealers in the country are a prime source of farm information to the farming community, besides the supply of inputs and credit. However, a majority of these dealers do not have formal agricultural education. In order to build their technical competency in

agriculture and to facilitate them to serve the farmers better and to act as para-extension professionals, MANAGE launched a self-financed one-year "Diploma in Agricultural Extension Services for Input Dealers (DAESI) Program" during the year 2003. Due to the positive impact of the program, the Ministry of Agriculture & Farmers' Welfare, Government of India decided to implement this program for Input dealers in all the States of the country. The technical information is delivered through contact classes by agricultural experts and practitioners at the district level on Sundays or Market holidays for 48 days including field visits spread over a year.

SAMETIs play a vital role in the implementation of DAESI in the concerned states through Nodal Training Institutes. MANAGE, SAMETI and the concerned Nodal Training Institute (NTI) carry out different sets of functions for conducting the DAESI course for the input dealers. There must be close coordination between all the stakeholders to make the program successful by training all the existing and prospective input dealers across the country. In this regard, the research team elicited different kinds of constraints faced by SAMETIs in the implementation of the scheme across the states. From Table 6, we can know that the major constraints are, Delay in getting proposals from the KVKs/SAUs/ ATMA to implement the scheme (3.27, neutral to agree), Problem in selection of facilitators (3.23, neutral to agree), Delay in getting Provisional Utilization Certificate from NTIs (3.20), Delay in getting the relevant documents from NTIs to forward to MANAGE for processing the certificates, Problem in mobilizing the candidates for the program (3.13 each, neutral to agree), Inadequate supporting staff for updating data into MIS, Problem in appointing facilitators (3.03 each, neutral to agree) and Inadequate infrastructure facilities for monitoring (3.00, neutral). The constraints with weighted average value of 3.00 and more only are discussed here as they fall in neutral, agree and strongly agree category.

Table 6. Constraints in Implementing CSPS Schemes -(DAESI)

S.No	Statement	SA	A	N	D	SD	WA
1	Problem in Selection of Facilitators	5	4	13	8	1	3.23
2	Problem in appointing Facilitators	3	3	16	7	2	3.03
3	Problem in mobilizing the candidates for the program	5	4	10	11	1	3.13
4	Difficulty in monitoring several batches by SAMETI	1	4	15	8	3	2.83

5	Problem in getting Resource Persons	1	1	12	13	4	2.50
6	No dedicated Staff for implementing/ monitoring the Scheme	3	3	11	9	4	2.73
7	Scheme work is overlapping with the other regular works of SAMETI	1	4	14	9	3	2.80
8	Difficulty in conducting the exams in involvement of SAMETI	0	5	8	15	3	2.57
9	ATMA being the implementing agency, lack of support from ATMA officials	1	3	11	11	5	2.57
10	Identifying suitable/ reliable NTIs	2	2	17	8	2	2.90
11	Inadequate infrastructure facilities for monitoring	1	8	12	8	1	3.00
12	Inadequate supporting staff for updating data into MIS	4	4	12	9	1	3.03
13	Inadequate orientation about DAESI guidelines to SAMETI staff	0	6	10	12	3	2.70
14	Inadequate orientation about DAESI guidelines to Facilitator	1	4	14	8	3	2.73
15	Inadequate knowledge about operational procedures among the concerned staff	2	2	13	11	3	2.73
16	Delay in receipt of Funds from MANAGE	2	1	12	12	4	2.60
17	Delay in release of Funds to NTIs	0	1	14	13	3	2.50
18	Delay in getting monitoring charges from NTIs	0	0	17	10	4	2.50
19	Inadequate monitoring charges for SAMETI for monitoring the program	0	7	13	8	3	2.87
20	Delay in Getting Provisional Utilization Certificate from NTIs	1	7	19	2	2	3.20
21	Difficulty in uploading data into DAESI portal.	0	7	13	8	2	2.83
22	Delay in getting proposals from the KVKs/ SAUs/ATMA to implement the scheme	3	8	13	5	2	3.27
23	Delay in getting approvals from MANAGE to start the program	0	2	14	13	2	2.60

24	Monitoring from MANAGE staff time to time	7	3	16	4	1	3.47
25	Satisfied with the timely guidance /advice given by MANAGE staff	7	10	9	4	0	3.67
26	Delay in getting the relevant documents from NTIs to forward to MANAGE for processing the certificates	2	8	13	6	1	3.13
27	Delay in getting certificates from MANAGE	1	6	14	7	3	2.93
28	Comfortable in operating DAESI portal	3	7	16	5	0	3.37
29	Delay in resolving the issues of DAESI portal from MANAGE	0	3	15	11	2	2.70

SA- Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree, WA: Weighted Average

To conclude, it can be observed that there are a sizeable number of constraints being faced by SAMETIs and NTIs since implementing the scheme requires effective coordination among the implementing agencies, regular interactions, guidance from MANAGE and SAMETI to the NTIs, etc. that may effectively improve the implementation process. SAMETIs also opined that they were satisfied with the timely guidance/advice given by MANAGE staff (3.67- neutral to agree), monitoring from the MANAGE staff from time to time (3.47, neutral to agree continuum) and comfortable in operating the DAESI portal (3.37, neutral to agree continuum).

Constraints in Implementing STRY

The Ministry of Agriculture & Farmers Welfare, Govt. of India, in compliance with the National Policy on Skill Development & Entrepreneurship 2015, has taken the initiative to implement the Skill Development Component, namely Skill Training of Rural Youth (STRY) under the Sub-Mission on Agricultural Extension (SAME) of the National Mission on Agricultural Extension & Technology (NMAET) during 2015-16.

STRY aims at imparting skill-based training to rural youth on agri-based vocational areas in agriculture & allied areas to promote employment in rural areas and for the creation of skilled manpower to perform farm and non-farm operations. Rural youth of the age group of 18 years and above with minimum qualification up to 5th standard passed (not mandatory) are considered for skill training. The Govt. of India has identified about 50

skilling areas spanning Agriculture, Horticulture, Animal Husbandry, Dairy and Fisheries. MANAGE, Ministry of Agriculture & Farmers Welfare at the national level coordinate this activity through SAMETIs at the State level. The training activities are implemented through SAMETIs at the State level and coordinated through ATMA at the District level. The training to rural youth is imparted through Krishi Vigyan Kendras, Nehru Yuva Kendras, Farmer Training Centers and/or any other identified training institutions at the State / District level.

The STRY scheme is implemented by SAMETI in the concerned states, and funded by the Ministry of Agriculture & Farmers' Welfare, Government of India through MANAGE. Table 7 shows different constraints faced by SAMETIs in the implementation of STRY scheme. The major constraints are Inadequate supporting staff for updating data into MIS (3.33, neutral to agree), Delay in getting the progress report from training institutes along with feedback in the prescribed formats after completion of the program (3.29,neutral to agree), Delay in getting Provisional Utilization Certificate from training institutes (3.21, neutral to agree), no dedicated staff for implementing/monitoring the scheme (3.04, neutral to agree), and Delay in updating the information on STRY portal in MANAGE website by training institutes soon after completion of the program (3.17, neutral to agree),

To sum up, adequate supporting staff and guidelines for training institutes for timely submission of the requisite documents may be developed for SAMETIs for smooth implementation of STRY scheme.

Table 7. Constraints in Implementation of STRY

S.No	Statement	SA	A	N	D	SD	WA	SUM
1	Difficulty in monitoring several batches by SAMETI	3	4	5	9	4	2.83	25
2	No dedicated Staff for implementing/ monitoring the Scheme	2	9	2	9	3	3.04	25
3	Inadequate supporting staff for updating data into MIS	3	8	5	9	0	3.33	25
4	Inadequate orientation about STRY guidelines to SAMETI staff	0	6	5	11	3	2.67	25

5	Inadequate orientation about STRY guidelines to training institutes	0	6	5	12	2	2.71	25
6	Inadequate knowledge about operational procedures to the concerned staff	0	4	5	12	3	2.42	24
7	Delay in receipt of Funds from MANAGE	2	0	6	13	2	2.33	23
8	Delay in release of Funds to Training Institutes	1	2	2	18	2	2.38	25
9	Delay in Getting Provisional Utilization Certificate from Training institutes	3	6	6	10	0	3.21	25
10	Delay in Compilation of the provisional UC/ Expenditure statement by SAMETI	0	3	6	15	1	2.54	25
11	Delay in sending the compiled provisional UC to MANAGE	0	4	5	15	1	2.58	25
12	Difficulty in uploading data into STRY portal	1	5	6	13	0	2.88	25
13	Delay in getting approvals from MANAGE to start the program	0	1	5	16	3	2.25	25
14	Close monitoring from MANAGE staff time to time	0	15	5	5	0	3.54	25
15	Delay in timely guidance/ advice provided by MANAGE staff	0	0	7	16	2	2.29	25
16	Delay in getting the relevant documents from training institutes for preparation of the certificates	1	2	8	13	1	2.67	25
17	STRY portal for updating information is not user-friendly	0	3	9	11	2	2.63	25
18	Delay in updating the information on STRY portal in MANAGE website by training institutes soon after completion of the program	1	8	7	9	0	3.17	25
19	Delay in resolving the issues of STRY portal from MANAGE	0	1	11	11	2	2.54	25
20	Delay in getting the progress report from training institutes along with feedback in the prescribed formats after completion of the program	2	8	7	8	0	3.29	25

21	Delay in compilation of the progress reports of training from all the training institutes by SAMETI	0	4	7	13	1	2.67	25
22	Delay in preparing the training calendar of STRY in SAMETI due to lack of communication from training institutes	0	9	4	10	2	2.92	25
23	Delay in sending the information on rescheduling of programs to MANAGE	0	3	9	11	2	2.63	25

SA- Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree, WA: Weighted Average

Constraints in Implementing PGDAEM

The extension personnel in the country working at district and block levels in the field of agriculture and allied sectors need to be transformed into a vibrant and useful knowledge force to bring about the desired changes in the agriculture sector. In order to bridge this ever increasing gap in knowledge, MANAGE launched a Post Graduate Diploma Programme in Agricultural Extension Management (PGDAEM) for the agricultural extension functionaries during 2007-08 in distance learning mode. The diploma would create a professional cadre of farm advisors in the country, both in the public and private sector, who eventually would take forward the agenda of agricultural extension.

From Table 8, it can be observed that the constraints faced by SAMETI include insufficient field exposure (3.52, neutral to agree), insufficient amount of institutional charges for State Nodal Institutes (3.41, neutral to agree), problem in bringing more percentage of candidates to attend contact classes (3.37, neutral to agree), insufficient amount of lodging and boarding charges of candidates during contact classes (3.26, neutral to agree), insufficient amount of honorarium for the study centre coordinator (3.19, neutral to agree) and to resource persons during contact sessions (3.15, neutral to agree), insufficient field oriented knowledge (3.04, neutral to agree).

To sum up, as mentioned by SAMETIs, there is need to improve the allocation of funds for institutional charges for state nodal institutes, lodging and boarding charges for candidates, honorarium for the study center coordinator, and resource persons during contact sessions. Insufficient field exposure, problem in bringing more percentage of candidates to attend contact classes and insufficient field oriented knowledge are important constraints identified from the study.

Table 8. Constraints in Implementation of PGDAEM

S.No	Statement	SA	A	N	D	SD	WA
1	Difficulty in delivery of extension services by the officers who have completed the PGDAEM program	3	3	5	12	4	2.59
2	Difficulty in understanding the content of the PGDAEM study material	1	3	4	14	5	2.30
3	Problem in bringing more percentage of candidates to attend contact classes	3	14	2	6	2	3.37
4	Difficulty in organizing contact classes in Physical mode	2	4	6	11	4	2.59
5	Problem in organizing contact classes in Online mode	2	7	6	8	4	2.81
6	Problem in conducting the examination	1	2	4	13	7	2.15
7	Problem in the Result submission	0	0	5	15	7	1.93
8	Insufficient number of contact classes organized	1	3	7	9	7	2.33
9	Difficulty in release of funds (GoI)	3	7	3	8	6	2.74
10	Difficulty in release of State share (budget)	0	7	4	10	6	2.44
11	Problem in study material distribution	0	5	6	13	3	2.48
12	Difficulty to implement PGDAEM program	1	7	2	13	4	2.56
13	Insufficient amount of honorarium to resource persons during contact classes	5	8	4	6	4	3.15
14	Insufficient amount of lodging and boarding charges of candidates during contact classes	4	10	5	5	3	3.26
15	Insufficient amount of Institutional charges for state nodal institute	4	11	5	6	1	3.41
16	Insufficient amount of honorarium for study centre coordinator	4	9	5	6	3	3.19
17	Insufficient field exposure	5	9	9	3	1	3.52
18	Insufficient field oriented knowledge	3	7	6	10	1	3.04
19	Irrelevant to all types of extension personnel	1	2	8	11	5	2.37

20	Non-availability of suitable resource persons for the contact classes	0	0	7	13	7	2.00
21	Difficulty in uploading the information in database of MANAGE	1	1	9	10	6	2.30
22	Delay in getting the assignments from the candidates for different courses	2	6	5	9	5	2.67
23	Delay in getting the project work from the candidates for different courses	2	7	5	8	5	2.74
24	Delay in fund release for conduct of contact classes	3	6	6	7	5	2.81
25	Delay in getting the final installment	3	6	5	7	6	2.74
26	Delay in issue of certificates	2	4	5	11	5	2.52
27	Unavailability of dedicated manpower for monitoring PGDAEM	4	5	6	7	5	2.85
28	Inadequate orientation about PGDAEM guidelines for SAMETI staff	2	3	5	12	5	2.44
29	Inadequate knowledge in operating procedures among the concerned staff	2	1	5	14	5	2.30
30	Inadequate support staff for uploading data into MIS portal	2	1	7	12	5	2.37

SA- Strongly Agree, A: Agree, N: Neutral, D: Disagree, SD: Strongly Disagree, WA: Weighted Average

Overall constraints of SAMETIs

The physical infrastructure is the basic facility that every organization should have, to carry out the mandated work. With regard to training institutes, a sufficient number of training halls, space for doing group activities, lodging and boarding facilities, chairs, tables, computers, internet facility, transportation facilities etc. are necessary for smooth conduct of the capacity building activities (Table 2). It can be understood that the infrastructural facilities in SAMETIs require improvement and hence there is a need to invest funds to develop physical infrastructure for the smooth functioning of day to day activities of SAMETIs.

Table 9. Overall Constraints

S.No	Statement	Weighted Average	Continuum (on a 5 point scale)
A.	**Human Resources**		
1	Lack of sufficient staff is hampering the work	3.32	Neutral to Agree
B.	**Financial aspects**		
2	Delay in getting the sanctioned budget	3.39	Neutral to Agree
C.	**Administration**		
3	Delay in getting promotions	2.97	Near to Neutral
D.	**Central Sector Plan Schemes**		
DAESI			
1	Delay in getting the proposals from KVKs/SAUs/ATMA to implement the scheme	3.27	Neutral to Agree
2	Problem in selection of facilitators	3.23	Neutral to Agree
3	Delay in getting the Provisional Utilization Certificate (PUC) from NTIs	3.20	Neutral to Agree
4	Delay in getting the relevant documents from NTIs to forward to MANAGE for processing the certificates	3.13	Neutral to Agree
5	Problem in mobilizing the candidates for the program	3.13	Neutral to Agree
6	Inadequate supporting staff for updating data into MIS	3.03	Neutral to Agree
7	Problem in appointing facilitators	3.03	Neutral to Agree
8	Inadequate infrastructural facilities for monitoring	3.00	Neutral
STRY			
1	Inadequate supporting staff for updating data into MIS	3.33	Neutral to Agree
2	Delay in getting the progress report from training institutes along with feedback	3.29	Neutral to Agree

	in the prescribed formats after completion of the program		
3	Delay in getting the Provisional Utilization Certificate (PUC) from Training Institutes	3.21	Neutral to Agree
4	Delay in updating the information on STRY portal in MANAGE website by training institutes soon after completion of the program	3.17	Neutral to Agree
5	No dedicated staff for implementing / monitoring the Scheme	3.04	Neutral to Agree
PGDAEM			
1	Insufficient field exposure	3.52	Neutral to Agree
2	Insufficient amount of Institutional charges for state nodal institute	3.41	Neutral to Agree
3	Problem in bringing more percentage of candidates to attend contact classes	3.37	Neutral to Agree
4	Insufficient amount of lodging and boarding charges of candidates during contact classes	3.26	Neutral to Agree
5	Insufficient amount of honorarium for study center coordinator	3.19	Neutral to Agree
6	Insufficient amount of honorarium to Resource persons during contact classes	3.15	Neutral to Agree
7	Insufficient field oriented knowledge	3.04	Neutral to Agree

The constraints which scored a higher weighted average (3 and above) are shown in the above Table 9. The major constraint in the case of human resources is the lack of sufficient staff hampering the work in a majority of SAMETIs. Delay in getting the sanctioned budget is also one of the major constraints due to which SAMETIs are unable to implement the programs in time as per the training calendars. The delay in getting promotions may cause low motivation among the SAMETI employees and that impacts the productivity of the institutes.

Further, with regard to the Central Sector Plan Schemes, in DAESI, delay in getting the proposals from KVK/SAUs/ATMA is a major constraint for SAMETIs which attracted

a weighted average of 3.27 on a 5 point continuum, followed by a problem in the selection of facilitator (3.23), delay in getting Provisional Utilization Certificate from NTIs with a weighted average of 3.20, delay in getting the relevant documents from NTIs to forward to MANAGE for processing of certificates (3.13), problem in mobilizing the candidates for the program (3.13), inadequate supporting staff for updating data into MIS (3.03), problem in appointing facilitators (3.03) and inadequate infrastructural facilities for monitoring the program (3.00).

With regard to STRY, the constraints are inadequate supporting staff for uploading data into MIS (3.33) followed by delay in getting the progress report from training institutes along with feedback in the prescribed formats after completion of the program (3.29), delay in getting the Provisional Utilization Certificate (PUC) from Training Institutes (3.21), delay in updating the information on STRY portal on MANAGE website by training institutes soon after completion of the program (3.17) and no dedicated staff for implementing /monitoring the Scheme (3.04) received weighted averages on a 5 point continuum.

Finally, with regard to PGDAEM, the constraints are insufficient field exposure (3.52), insufficient amount of institutional charges for state nodal institute (3.41), problem in bringing more percentage of candidates to attend contact classes (3.37), insufficient amount of lodging and boarding charges of candidates during contact classes (3.26), insufficient amount of honorarium for the study centre coordinator (3.19), insufficient amount of honorarium to resource persons during contact classes (3.15) and insufficient field oriented knowledge, with a weighted average of 3.04, attracted the weighted averages shown in parenthesis on a five-point continuum.

Conclusion

SAMETIs were established as part of the Extension Reforms in the country. At the state level, SAMETIs play an anchor role in training and capacity building of extension functionaries and farmers. Right from the Royal Commission Report in 1927, National Commission on Agriculture 1973, National Commission on Farmers 2006 and Doubling Farmers Income Report 2017, there have been several recommendations to improve the extension systems across the country. A SAMETI at the state level is a major institutional

setup to carry out the extension reforms and disseminate knowledge to the extension functionaries through capacity building activities; in turn, the extension functionaries at the middle and grass root level add value by providing extension advisories to the farming community. Hence, these institutes need to be equipped with all the necessary facilities that are required for achieving the objectives of the Extension Reforms.

The present study revealed some surprising facts regarding the infrastructural facilities in respect of insufficient number of training halls, space for group work etc. Infrastructure facilities are a basic minimum and primary in carrying out the day to day activities of any institute. In a few of the cases, SAMETIs are run in rented buildings while a few are in the premises of the Department of Agriculture of the concerned states. Hence, there is an urgent need to strengthen the SAMETIs in terms of independent housing for academic purposes and hostel facilities, sufficient manpower, physical infrastructure, proper internet connectivity, library facilities etc.

Further, with regard to Human Resources, a majority of the SAMETIs lack sufficient staff especially the Deputy Directors and other supporting staff to carry out regular activities and also to implement the state and central sector schemes like DAESI and STRY and to conduct the PGDAEM program. There is an urgent need to focus on recruitment to fill the vacant positions of Deputy Director and other support staff in SAMETIs across the country. Majorly, the officers are deputed from the line departments as faculty members. A few SAMETIs expressed that officers with vast field experience and genuine interest in training may only be deputed to SAMETIs. Coordination among the Department of Agriculture, line departments and SAMETIs is very important for the development of agriculture as well as for the wellbeing of the farmers. The respective Governments and the State Departments of Agriculture may give due importance and relook into the deputation policies and strengthen SAMETIs by adhering to the minimum tenure of transfers.

Besides, the budget for the SAMETIs and grants from different institutes may be released in time to SAMETIs to meet the expenditure for training programs, CSPS activities, etc. as per the training calendar.

With regard to the Central Sector Plan Schemes (CSPS), and in particular DAESI, in a very few cases, SAMETIs opined that the availability of facilitators and participants are

major constraints in the implementation of DAESI. The State Coordinators from SAMETIs may take necessary steps to overcome these constraints by keeping in touch with NTIs and ATMAs of the state concerned. The majority of the SAMETIs had apprehensions about the amount of honorarium to resource persons and breakfast and lunch during the classes. The guidelines may be revisited and MANAGE may take lead in negotiating with MoA&FW, GoI. There must be effective coordination between NTI, SAMETI and MANAGE in all aspects, right from the selection of the candidates, entering of data into MIS portal, exams and sending the evaluation report to MANAGE to the submission of the provisional utilization certificate to MANAGE, which is most important in the release of certificates and these aspects may be taken care of by SAMETIs. In the case of STRY, more or less similar constraints were expressed by SAMETIs. The duration of the training may be increased to 15 days in order to fully equip the participants with the specified skill in STRY training programs. In the case of PGDAEM, a majority of the SAMETIs expressed concerns about insufficient field exposure, insufficient field oriented knowledge and insufficient cost norms.

A special session for orienting to guidelines of DAESI, STRY and PGDAEM may be arranged for SAMETIs and NTIs by MANAGE and SAMETIs

The primary purpose of establishment of SAMETIs may be kept in mind by the concerned State Governments and Department of Agriculture and line departments of the state. In order to push the extension reforms at a faster pace, SAMETIs need to be equipped with regular staff and frequent deputations and transfers may be restricted. The sanctioned strength may be recruited as and when the posts become vacant.

SAMETIs that were established to push the reforms through capacity building of extension functionaries busied themselves with repeating regular and routine training programmes, compromising the very spirit and purpose (https://agricoop.gov.in/sites/default/files/DFI%20Volume%2011.pdf). The autonomy of the SAMETIs is ought to be respected by the Department of Agriculture and other line departments.

To conclude, there is a pressing need to improve the infrastructural conditions of SAMETIs across the country. Institutions, in order to be consistently vibrant, must always carry out improvements to serve the mandate. SAMETI at the state level and ATMA at the district level are the two wheels of the same cart taking farmers in the direction of growth and

development through the mandated activities. There are apprehensions from a few of the SAMETIs with regard to the cooperation from ATMA. Hence, SAMETI and ATMA should act hand in hand in all the activities where coordination and cooperation are required. Finally, the respective state Government may sanction sufficient resources in terms of infrastructure, human resources, financial and other necessary resources to make the SAMETIs more vivacious.

Recommendations

Based on the study, keeping in view the role of SAMETIs in achieving the extension reforms, the following recommendations are proposed:

1. Lack of physical infrastructure adversely affects the effectiveness of the training programs. Hence, every SAMETI may be equipped with proper and independent buildings to carry out the work. Other infrastructural facilities like training halls, group rooms, sufficient number of chairs, tables; computers with internet connection, library facilities and most importantly transportation facilities may be improved for Faculty and as well as for the participants.
2. In a few SAMETIs, lodging and boarding facilities are not available and in some cases, SAMETIs depend on private facilities on rental basis which creates insecurity in the minds of participants. For longer duration training programs, the participants need to stay on the campus. Hence, proper lodging and boarding facilities may be provided in every SAMETI.
3. Wherever possible, a separate women's/girls' hostel may be constructed and the fund may be sanctioned by the respective governments in this regard.
4. Library facility may be arranged and separate fund may be allotted to SAMETIs for purchase of relevant books of interest. A Library is a part of the training methodology, where the participants refer to relevant books for preparation of the PPTs, in writing assignments and reports during the training programs. One post of librarian may be sanctioned for every SAMETI.
5. The possibility of installation of solar power may be examined and one time fund may be given to SAMETIs to shift into the production of non-conventional energy for institutional purposes.

6. Proper transportation facilities like a bus, mini-van for exposure visits of participants and conveyance for movement of the Director may be sanctioned.
7. Positions may be filled as per the sanctioned posts. In a majority of the SAMETIs, Deputy Director positions are vacant and in a few of the SAMETIs, there is no regular Director available. All the positions may be filled at the earliest for smooth functioning of the institute.
8. Deputations from the Department of Agriculture and other line departments may be based on the candidates' interest in the training function and field experience.
9. The deputed officers may be retained for at least 3 years of tenure and frequent transfers may be avoided.
10. The positions of Accountant-cum-Clerk, Computer Operator may also be filled on a regular basis in order to keep the human resource position of SAMETIs strong.
11. Funds may be provided to recruit sweepers, peon, electrician, hostel manager and driver on a contractual basis.
12. The sanctioned budget may be released in time directly to SAMETI.
13. The Executive and General Council meetings may be conducted at regular intervals to take necessary decisions and guide SAMETIs accordingly.
14. The promotion policy may be revisited.
15. SAMETI may submit the required documents in time so that MANAGE may timely release the funds for the Central Sector Plan Schemes.
16. With regard to DAESI, the State Coordinator for DAESI may take necessary steps in selection of reliable NTIs and MANAGE may guide the SAMETI staff in the process and procedures for screening and selection of NTIs.
17. The Director, SAMETI may assign responsibility to each Deputy Director to look after the scheme related activities. Dedicated staff ensure continuity of timely activities. The Director, SAMETI may liaise with the Department of Agriculture for recruitment of staff so that the scheme related work may not overlap with the regular work.

18. Proper orientation may be given to SAMETI officials with respect to DAESI, STRY and PGDAEM guidelines. MANAGE Consultant may take lead in the activity.

19. Timelines for every DAESI activity may be fixed by MANAGE officials with regard to approval of batches, funds, timely reports from SAMETI/ NTI, exam schedule and release of certificates. There may be a deadline for approval of batches, so that all batches may start in a systematic way. The Principal Coordinator, DAESI may take the lead to release the DAESI calendar every financial year and accordingly, activities may be carried out by the consultants.

20. Assessment of performance of NTIs may be taken up by MANAGE/SAMETI and the NTIs which do not submit the relevant documents in time and cause delay in dispatch of certificates from MANAGE may be avoided to continue as NTIs.

21. Institutional charges, working lunch to participants, honorarium to resource persons may be enhanced as per the financial provision. MANAGE may take lead in this regard to liaison with the Ministry of Agriculture & Farmers Welfare, Government of India.

22. Issues regarding DAESI portal may be resolved by MANAGE Consultant in coordination with the NTIs. There is a demand from a few SAMETIs regarding the edit option. Keeping in view the security of data, the option of editing MIS data may rest with MANAGE.

23. The number of training days may be increased from 6 to 10 in STRY.

24. In the case of PGDAEM, bi-lingual study material may be prepared and timely dispatch of materials is also highly recommended.

25. Timelines may be prepared for the conduct of PGDAEM well in advance and the timelines may be strictly followed by MANAGE.

26. Cost norms may be revised based on the availability of the funds for PGDAEM in certain aspects.

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Assessment of International Training Program on ICT Applications in Agricultural Extension Management for Officials from Africa and Asia

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Abstract

The application of Information and Communication Technologies (ICTs) has become increasingly important in agriculture. Today we are seeing the growing use of ICT in the learning process. Currently, ICT based advisory services are a part of the extension system in several developing countries. A study was conducted to assess an International training program on ICT applications in Agricultural Extension Management (Farmers' Call Centre) organized by MANAGE, under Feed the Future India Triangular Training (FTF ITT) initiative, for officials from Africa and Asia. Participants from six countries attended the training and were the respondents of the study. The Program was assessed on five points and most of the participants rated the program as excellent to good and their responses revealed that they were satisfied with the training programme.

Keywords: Training, ICTs, agricultural extension

Introduction

The application of Information and Communication Technology (ICT) across different sectors of the global economy has become a game changer. ICT plays an important role in enhancing work efficiency, accurate processing of data and output. The utility of ICTs is increasing in the agricultural sector for advisories on crop production/protection, post-harvest management, market scenario, efficiently managing land, labour, capital, and soil.

Training is considered as a tool through which organizations can enhance the human capital. With the focus on the application of ICTs, it is important to design training programs to

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impart knowledge and skills in using and developing ICT tools for future use. The International training program on ICT applications in Agricultural Extension Management (Farmers' Call Centre) organized by MANAGE during 11th to 25th March 2019, under Feed the Future India Triangular Training (FTF ITT) initiative was one such effort to train officials in Africa and Asia based on ICT innovations adopted in Indian agriculture.

The Kisan Call Centre (Farmer Call Centre) is an innovative and modern national scheme for expeditiously delivering extension information and support to the farmers, using the telecommunication network. It helps overcome the challenges such as less manpower in extension systems to respond to the needs of every farmer. Further, the Kisan Call Centre (KCC) plays a significant role in meeting the urgent demands and queries for the latest information by the farmers. Similar constraints were also reported in several developing countries of Asia and Africa (The Manufacturer's Annual Manufacturing Report, 2017). Hence, there was a need for training and capacity development of agriculture extension officers on the use of ICT applications. This study was planned with the objective to assess the International training program on ICT applications in Agricultural Extension for officials from Africa and Asia.

Methodology

This research was carried out with the help of a structured interview questionnaire which was then administered using Google Forms. After feeding the questionnaire in the Google Form, the link to the Form was sent by email to a total of 35 executives who had participated in the training. The data was collected on the profile of the trainees and the assessment of the training by the trainees. The assessment and feedback were ascertained on course content, facilitation for arrival and departure, coordinators' skill and support at the training institute and overall learning from the course. The specific feedback from the trainees was obtained for 10 points with options to respond as 'agree', 'undecided' and 'disagree'. The responses were received from 29 executives and analysed. The frequency and percentage analysis were followed to extrapolate the data.

The training programme focused on the concept of Information and Communication Technology (ICT) and its role in agriculture and rural development, advanced ICT' tools in agriculture and allied sectors, impact of ICTs on farmer's welfare, case studies on ICTs and their implication in developing countries and introduction to the Farmers' Call Centre (FCC), Kisan Knowledge Management Repository, Farmers' Portal and M-Kisan Portal.

Results and Discussion

The distribution of executives based on country, general assessment of the training programme by the respondents and specific feedback on the programme by the respondents is discussed below:

Distribution of executives based on country

The findings (Table 1 and Table 2) clearly show that out of 35 executives, 20 were from Afghanistan, four from Nepal, three from Tanzania, two from Myanmar and one each from Cambodia, Kenya and Malawi. There were 31 male executives and four female executives from different organisations. Out of 35 executives, 30 executives were from agriculture and allied sciences, three from private companies and two from civil societies. Kisan Call Centre (Farmers' Call Centre) was one innovation that impressed the trainees the most. Trainees who had attended the FTF training conducted at MANAGE had requested for this training program with special focus on Farmers Call Centre.

As part of this program, a total of 35 executives, from eight countries, who are working on replicating the KCC in their respective countries were taken to the Ministry of Agriculture to demonstrate the real-time operations of the KCC.

Countries	Number of Executives
Afghanistan	20
Cambodia	01
Myanmar	02
Nepal	04
Sri Lanka	03
Kenya	01
Malawi	01
Tanzania	03
Total	**35**

Table 1: Distribution of executives based on country

Public: Agriculture and Allied Sciences	30
Private: Private Companies	3
Civil Society: NGOs, Cooperatives	2
Total	**35**

Table 2: Sector-wise distribution of executives

General assessment of training programme by the respondents

Figure 1 depicts the general assessment of the training programme by the respondents on five aspects, viz., course content, facilitation for arrival and departure by MANAGE, coordinator's skill and support at the training institute, relevance to their needs and overall learning from the programme.

Course Content: The findings clearly show that more than three-fifths of the respondents (65.52%) found the content of the training programme very good followed by 31.03 per cent, who indicated that the course content was excellent. Only 3.45 per cent of the respondents indicated that the course content was fair.

Facilitation for arrival and departure by MANAGE: Similarly, 44.82 per cent of the respondents indicated that the facilitation for arrival and departure by MANAGE was very good, followed by 41.38 per cent who indicated that it was excellent. An equal per cent of the respondents i.e. 6.90 per cent stated that the facilitation for arrival and departure by MANAGE was fair and average.

Coordinator's skill and support at training institute: More than two-fifths of the respondents (41.39%) found the Coordinator's skill and support at the training institute very good. This was followed by 31.03 per cent of the respondents who indicated that it was excellent, 20.68 per cent informed that the Coordinator's skill and support at the training institute was fair while a few respondents (6.90%) indicated that the Coordinator's skill and support at the training institute was average.

Relevance to their needs: Further the findings indicated that nearly two-fifths of the respondents (37.93%) had stated that the relevance of the training programme to their needs was very good followed by 31.03 per cent who informed that the relevance of the training programme was fair. About 27.59 per cent of the respondents informed that the relevance of the training programme to their needs was excellent while only 3.45 per cent of the respondents informed that the relevance of the training programme to their needs was average.

Overall learning from the course: Further, 62.07 per cent of the respondents (indicated that they had very good overall learning from the course, followed by 31.03 per cent of

the respondents who stated that the overall learning from the course was excellent whereas a few of them (6.90%) stated that the overall learning from the course was fair.

Therefore, it can be concluded that a majority of the respondents found the course content, facilitation for arrival and departure by MANAGE, coordinator's skill and support, relevance of the training programme and overall learning experience from the training very good. This finding was in line with findings by Giangreco et al. (2010); Sitzmann, et al. (2008); and De Meuse et al. (2007). Therefore, there is scope for MANAGE to further improve the course content to make the content excellent to the international extension personnel.

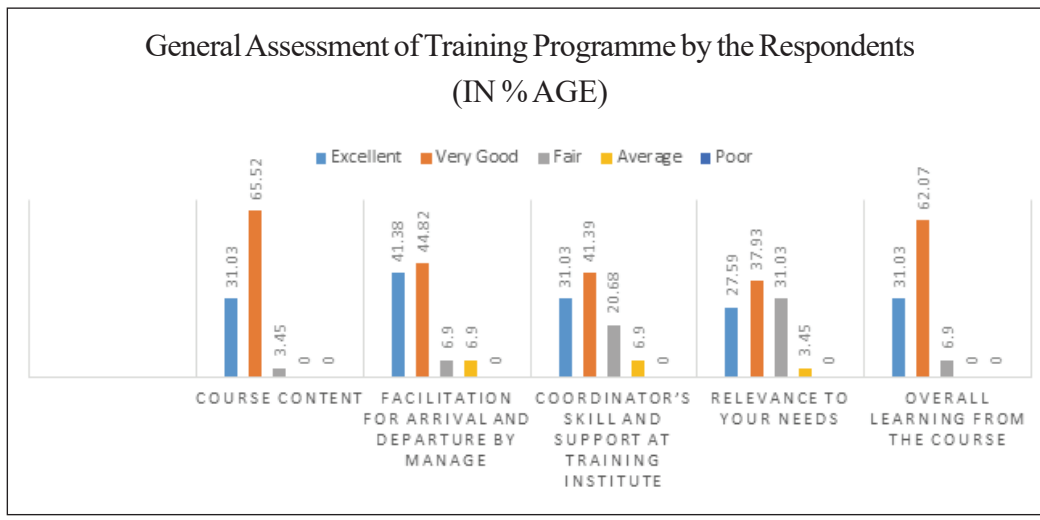

Fig. 1: General assessment of training programme by the respondents

Specific Feedback on the Training Programme by the Respondents

The specific feedback on the training programme by the respondents is presented in Table 3. It is seen from the findings that a majority of the respondents (93.10%) agreed that they could use the information which they had learnt and the skills acquired followed by 89.66 per cent who responded that additional knowledge was gained due to the programme, teaching aids used were well prepared and comfortable in viewing, 89.65 per cent responded that they would recommend this programme to others and participants had enough opportunities to interact with the trainers. Resource materials were well organised, useful and adequate according to 86.20 per cent of the respondents and topics

were updated to suit the present scenario (82.75%). Around 72.41 per cent of them agreed that the training methodologies used were interesting and relevant for the purpose, speakers were clear in their presentation and trainees were given relevant information, and expectations from the course were mostly fulfilled. A little over half of the respondents (51.72%) agreed that the proportion of exercises/case studies/examples was adequate.

Further, more than one-fourth of the respondents (34.49%) were undecided that the proportion of exercises/case studies/examples was adequate, followed by more than one-fifth of the respondents who were undecided that the expectations from the course were mostly fulfilled (24.14%). Around 20 per cent of the respondents were undecided that the training methodologies used were interesting and relevant for the purpose and speakers were clear in their presentation and trainees were given relevant information. Less than one-tenth of the respondents (17.25%), were undecided that the topics were updated to suit the present scenario, 10.35 per cent were undecided that they would recommend this programme to others and 10.34 per cent were undecided that they had gained additional knowledge and teaching aids used were well prepared and comfortable in viewing.

A closer look at the data shows that 13.79 per cent of the respondents disagreed with the statement that the proportion of exercises/case studies/examples was adequate. This suggests that additional hands-on exercises and case studies are necessary to make the program more practical for the learners. 6.90 per cent of participants disagreed with the statements that resource materials were well organized, useful and adequate, speakers were clear in their presentation and trainees were given relevant information and training methodologies used were interesting and relevant for the purpose. Therefore, the future training course on the same theme may take care of this feedback and ensure appropriate learning material and training methodologies. Further, 3.45 per cent of the participants have shown disagreement with the statements that expectations from the course were mostly fulfilled and they had enough opportunities to interact with the trainers. Therefore, a platform may be provided to the trainees to have an open discussion and interaction with the other trainees.

Therefore, it can be concluded that most of the respondents agreed that they could use the information which they had learnt and skills acquired, additional knowledge was gained due to the programme, teaching aids used were well prepared and comfortable in viewing, this programme can be recommended to others and participants had enough opportunities

to interact with the trainers, resource materials were well organised, useful and adequate and topics were updated to suit the present scenario. In addition, the training methodologies used were interesting and relevant for the purpose and speakers were clear in their presentation and trainees were given relevant information, expectations from the course were mostly fulfilled and the proportion of exercises/case studies/examples was adequate. The findings were in accordance with Kharkar et al. (2020).

Table 3: Specific feedback on training programme by the respondents

S.No.	Statements	Agree		Undecided		Disagree	
		f	%	F	%	f	%
1.	Expectations from the Course were mostly fulfilled	21	72.41	07	24.14	01	3.45
2.	I will recommend this programme to others	26	89.65	03	10.35	00	00
3.	Proportion of exercises/case studies/ examples was adequate	15	51.72	10	34.49	04	13.79
4.	Topics were updated to suit the present scenario	24	82.75	05	17.25	00	00
5.	Additional knowledge was gaine d due to the programme	26	89.66	03	10.34	00	00
6.	Resource materials were well organized, useful and adequate	25	86.20	02	6.90	02	6.90
7.	Teaching aids used were well prepared and comfortable in viewing	26	89.66	03	10.34	00	00
8.	Speakers were clear in their presentation & trainees were given relevant information	21	72.41	06	20.69	02	6.90
9.	Participants had enough opportunities to interact with the trainers	26	89.65	02	6.90	01	3.45
10.	Training methodologies used were interesting and relevant for the purpose	21	72.41	06	20.69	02	6.90
11.	I can use the information learned and skills acquired	27	93.10	02	6.90	00	00

Summary and Conclusion

The findings of the study revealed that most of the respondents found the course content, facilitation for arrival and departure by MANAGE, coordinator's skill and support, the relevance of the training programme and overall learning experience from the training very good. A majority of the respondents agreed that they could use the information which they had learnt and skills acquired, additional knowledge was gained, teaching aids were well prepared and comfortable in viewing, this programme can be recommended to others and they had enough opportunities to interact with the trainers, resource materials were well organised, useful and adequate and topics were updated to suit the present scenario. The training methodologies used were interesting and relevant for the purpose and speakers were clear in their presentation and trainees were given relevant information, expectations from the course were mostly fulfilled and the proportion of exercises/case studies/examples was adequate.

Recommendations

Only a small percentage of respondents thought that the course material, facilitation, coordinator's skills, and training were fair or average in terms of their relevance. Hence, it is suggested that the curriculum may be redesigned to include more case studies and real case examples. This could be accomplished by organising more practical and a greater number of exposure trips. These will enable them to learn from the real-time experiences and facilitate them in replicating the good practices in their countries. In addition, the courses need to be tweaked to meet the individual demands of CEOs from other nations. Furthermore, a consultative conference with the executives of each FTF-ITT is required in future. This will help in understanding the needs of executives of different FTF-ITT countries, coupled with delivering the need-based training to the executives.

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Developing Local Food System in India - A Case of Rythu Bazaars in Telangana

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Abstract

This paper discusses the various policy initiatives taken by the Government to encourage desired reforms in agricultural marketing to promote the local food system, the provisions suggested under the reforms to facilitate direct contact between the producers and consumers and the model of farmers market emerging as an outcome of reform measures. The paper also discusses the implementation of Rythu Bazaar (Farmers-market) in Telangana as an example to promote local food systems by encouraging farmer and consumer interaction.

Keywords: Farmers market, Rythu Bazaar, Agricultural marketing, local food systems.

Introduction

Promoting local supply chains has been one of the strategies suggested by Honourable Prime Minister Shri Narendra Modi in his address to the nation on 12th May 2020 in the wake of lock-down enforced in the country due to the coronavirus epidemic. Though, the idea was suggested in a larger economic context, it is equally applicable in agriculture mainly in an environment where more than 86 per cent of the farmers are operating on small and marginal landholdings. Local food can be defined as the food that is locally produced, marketed and consumed (Hand and Martinez, 2010). This concept may also be influenced by geographical, physical, psychological and cultural factors (Mary, 2018, Martinez et al., 2010 and Darby et al., 2008, Durham, et al., 2009). Burnett (2011) used a dynamic approach of local food to understand the willingness of the consumer to pay for locally grown produce and observed that the willingness to pay for fresh produce increases as the geographic scale shrinks, suggesting that consumers may place a higher

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premium on foods under tighter definitions of "local". The localness of agricultural produce also emphasises transparent communication by facilitating interaction between farmers and consumers so that consumers can make more informed purchasing decisions. Direct interaction between farmers and consumers or institutions like canteens, schools, etc., offers benefits like the flexibility to select the quality and quantity of products available for sale, freedom from contracts and frequently higher per unit sales prices than other marketing channels (Willis et al., 2016). The local food system may offer benefits like a greater share in the retail purchase price of food items, growth in local labour markets, increased business for the nearby establishment, improve local economies through import substitution (Burnett, 2011) and help farmers fetch a premium price (Darby, 2008, Burnett, 2011 and David, et al, 2016). Some of the benefits of local food system as compiled by USDA (2009) are health and nutrition, local economic development, environmental benefits, food security and market opportunities for small and medium farmers. The potential of local food system to address the wide range of issues faced by farmers and the rural economy makes it pertinent to discuss the policy initiatives taken by the government to strengthen agricultural marketing with scope for development of the local food system.

With this background, the present paper discusses the various policy initiatives taken by the Government to encourage desired reforms in agricultural marketing to promote local food systems, the provisions suggested under the reforms to facilitate direct contact between producers and consumers and the model of farmers market emerging as an outcome of reform measures. The paper also discusses in detail the implementation of Rythu Bazaar (Farmers-market) in Telangana as an example to promote the local food system by encouraging farmer and consumer interaction.

Policy Environment for Developing Local Food System

The landscape of agricultural production and marketing has undergone changes in the last few years on account of forces of globalisation, changing demand pattern with rising incomes and urbanisation, rapid strides in information and communication technologies, and transformative roles for institutional actors in the state, private sector and civil society (Rao, et al., 2017). Recognising the importance of these changes in creating opportunities for better participation of farmers and income enhancement, the Government of India has come up with several reforms specifically in agricultural marketing, to create a conducive environment for different stakeholders to participate and tap the opportunities. A snapshot of these reforms is provided in Table 1.

Table 1. Agri-Marketing Reforms in India

S. No	Reforms Initiated	Provision	Influence
1	Model State Agricultural Produce Marketing (Development and Regulation) Act, 2003	▪ Establishment of private/ cooperative markets ▪ Direct marketing ▪ Establishing farmer/ consumers market ▪ Single point levy of market fee	State
2	Model State/UTs Agricultural Produce and Livestock Marketing (Promotion and Facilitation) Act, 2017	▪ Declaration of whole state/ UT as one unified market ▪ APMCs to regulate practices only in respective principal market yards and sub-yards ▪ Warehouses to operate as sub-market yards	State
3	Warehouse Development and Regulation Act, 2007	▪ Negotiability of warehouse receipt	National
4	National Agricultural Market	▪ Integration of Markets ▪ Integration of other services like warehouses, banks, grading and assaying, etc	State (subsequently National)
5	The Farmers' Produce Trade and Commerce (Promotion and Facilitation) Bill, 2020	▪ Barrier free inter and intra state trade across the country ▪ Freedom of trade in farming produce outside APMC Market Yards	National
6	The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Bill 2020	▪ National framework for farming agreements	National

The Farm Acts introduced during 2020 have now been repealed by the Government. However, it clearly indicates the requirement of the sector and the intent of the government to have a transparent, competitive and liberal market operating at the national level with the ability to provide better alternatives to farmers and traders to buy or sell agricultural commodities. These reforms may have proved to be a significant step towards making Indian agriculture more demand-driven, accessible and competitive both at the domestic and global level. The repeal of the Farm Laws will definitely slow down the reform process in agricultural marketing.

Model Acts circulated by the Government during 2003 and 2017 also have great potential and may help in bringing the desired changes by adopting various provisions suggested in these Acts. The various provisions suggested in Model Acts have facilitated 27 States/ UTs in amending their respective APMC with the provision of direct marketing. In the absence of such provisions facilitating direct marketing, processors and bulk buyers were not able to source the produce directly from farmers outside the market yards and the transaction was required to be routed through regulated markets.

Direct Marketing

Direct marketing allows farmers to transact directly with consumers. It can be through two formats as suggested in the Model Act (2003 and 2017), either by allowing the bulk buyers like processors and organized retailers to source agri-produce directly from producer-seller or through farmers' markets.

Direct Sale by Producers to Bulk Buyers

The provision of direct marketing allows the bulk buyers to source the produce directly from the agriculturist for processing, trade in the commodity of a particular specification, export and grading, packing and transaction in other ways by value addition of notified agricultural produce. The provision allows the direct sale of produce by farmers to processors, exporters and buyers without the involvement of any middlemen outside the market yard in the market area. The direct marketing between producers and buyers will result in monetary gains to both the producer-seller and the consumer. Direct sourcing as suggested in the Model Act allows farmers to communicate directly with buyers by avoiding the long chain of intermediaries, leading to better flow of information and realization of

higher value by farmers. However, the response of buyers to avail the benefits available under the provision has so far been lukewarm as suggested by the number of licenses issued by different states. A total of 294 licenses have been issued by ten states with nearly 75 percent of licenses being issued by Maharashtra alone (GoI, 2017).

Farmers Market

Another format of direct marketing is the concept of farmers' market. Farmers markets facilitate direct sale to consumers by farmers which has been considered at par with many other provisions prescribed under reforms (Chand and Singh, 2016). The concept has been experimented with, in various states with different names like Apni Mandis in Punjab and Haryana (Table 2). The concept, with certain modifications, has been popularized in Telangana and Andhra Pradesh through Rythu Bazaars, Raitha Santhe in Karnataka and in Tamil Nadu as Uzhavar Santhai (GoI, 2001). About 488 such farmers' markets are operating in different States of the country (GoI, 2017). Direct contact between the producer and consumer is helping farmers in availing a higher share in the price paid by the consumer. These markets aim at rebuilding the trust between consumers and producers and serve as a platform for education and advocacy (Zhenzhong, et al, 2015). However, these markets mainly provide a platform for direct transaction between producers and consumers to encourage local food systems by facilitating the supply of locally grown fresh produce, unlike the western concept where the platform is utilized for education and extension in addition to marketing.

Table 2. Direct Marketing Experimented in Different States

State	Name of Farmers-Market	Year	Presence of Intermediaries	No. of Markets	Administration
Tamil Nadu	Uzhavar Santhai	1999-2000	No	104	Marketing Department
Andhra Pradesh	Rythu Bazaar	1999	No	96	APMC
Punjab	Apni Mandi	1987	No	67	APMC
Maharashtra	Shetkari Bazaar	2003	No	45	APMC
Karnataka	Raitha Santhe	2002	No	–	Local Authority Gram Panchayat

Source: dmi.gov.in

Implementation status of Rythu Bazaar in Telangana

The concept of farmer-market encouraging direct interaction between the producer and consumer is implemented with the name of Rythu Bazaar in Telangana. The concept has been discussed in this section as an example to promote the local food system.

Concept and its Implementation

Rythu Bazaar, the farmers' market was a social initiative started by the state government in 1999 (undivided Andhra Pradesh). The main objective of the initiative was to help farmers sell their produce directly to consumers without the involvement of intermediaries. Rythu Bazaar aims at ensuring remunerative prices to the farmers and providing fresh vegetables to consumers at reasonable rates fixed everyday through a committee of farmers and the Estate Officer. The prices in Rythu Bazaars, generally, shall have to be 25 per cent above the wholesale rates and 25 per cent less than the local retail price.These markets are operating with temporary/semi-permanent structures created by respective Agricultural Market Committees (APMCs). Farmers and consumers are not expected to pay any service charges or market fee for availing sheds and other facilities available in these markets (Department of Agricultural Marketing, Government of Telangana). Interested farmers have to get registered with the market. All the registered farmers are provided with an ID Card having basic details like name, address, landholding size, barcode, etc. The ID Cards are issued to a farmer-couple and are not transferrable to other farmers or members of the family. The markets provide basic facilities like shops and weighing machines. As the markets deal in fresh vegetables, some of the markets also have cold storage facilities which are made available at a nominal charge to the producers.

Market Coverage in the State

The concept was introduced in undivided Andhra Pradesh in 1999, and the state government of Telangana continued its focus on the concept even after its separation from Andhra Pradesh in the year 2014. A total of 39 markets are operating successfully in ten districts of the state (Figure 1&2). The progress seems to be reasonable but is confined to only ten districts. There are 23 more districts to be covered.

Fig 1. Coverage of Rythu Bazaars in Telangana

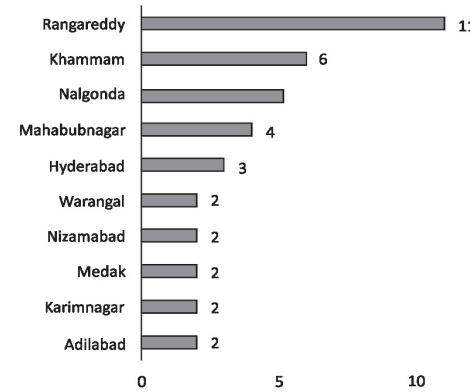


Fig 2. District-wise Number of Farmers' Market in Telangana

Value of Trade in Farmers' Market

The Rythu Bazaar has emerged as an important market alternative for farmers cultivating fresh vegetables as suggested by the value of trade performed in farmers' markets operating in different districts of Telangana during 2018-19 (Table 3). The table reveals that a total trade value of Rs.76637 lakh was performed in all the farmers' markets with nearly 40 percent of the trade in three Bazaars of Hyderabad located at Mehdipatnam, Falaknama and Erragadda. More than 26 percent of the value is traded in the adjoining district of Ranga Reddy. However, a total of 11 Bazaars are operating in Ranga Reddy district, which is the largest number of markets operating in a single district in Telangana. The table suggests that nearly two-thirds of the trade is taking place in 14 Rythu Bazaars operating in these two adjoining districts of Hyderabad and Ranga Reddy. This may be due to the availability of consumers in these two districts which may be a defining factor in the success of an initiative like Rythu Bazaar encouraging a direct relationship between producers and consumers. The identification of the location with a sufficient consumer base is emerging as an important factor for establishing a platform encouraging consumption of produce locally without any need to push the harvest in a long distribution chain.

Table 3. Value of trade performed in Farmers' Market during 2018-19 (in Rs. Lakhs)

S. No.	Districts	Value (Rs. Lakhs)	Value (as % of Total Value)
1	Hyderabad	30298	39.53
2	Rangareddy	20136	26.27
3	Mahbubnagar	8170	10.66
4	Khammam	8141	10.62
5	Medak	3112	4.06
6	Warangal	1623	2.12
7	Adilabad	1325	1.73
8	Nalgonda	1300	1.70
9	Karimnagar	1287	1.68
10	Nizamabad	1244	1.62
11	Total Value	76637	100.00

Source: Department of Agricultural Marketing, Government of Telangana

Effectiveness of Farmers' Market

It is also important to understand the effectiveness of farmers' markets in promoting local food systems by analysing their ability to capture local production in terms of the proportion of vegetables produced in the district attracted by these markets. The information on district-wise production of vegetables and arrival in these markets is presented in Table 4. Hyderabad, being an urban centre, is not having any significant production of vegetables and also expects to have arrivals from both Ranga Reddy and Medchal districts. Accordingly, in order to facilitate the analysis of arrivals with respect to production, a concept of an urban cluster has been conceived. The urban cluster from the consumption viewpoint consists of Ranga Reddy and Hyderabad districts i.e. commodities arriving in all the Farmers' Markets located in districts Ranga Reddy and Hyderabad. From the production point of view, the corresponding area is Ranga Reddy and Medchal i.e. vegetables produced in these two districts. The information as presented in the table

reveals that some of the districts are really performing well by capturing more than 20 percent of the production like Khammam, Urban Cluster and Mahabubnagar, in the same order. The districts like Medak and Karimnagar are also doing well with each district capturing more than ten percent of the total vegetable production. Overall, all Rythu Bazaars operating in the states are able to capture more than 20 percent of the total vegetables produced in the state. This ability to capture local production has gone as high as 48 percent in Khammam district and 27 percent in Mahbubnagar district. This suggests that these markets can play a vital role in developing an effective local food system encouraging consumption of production locally and helping farmers obtain better prices.

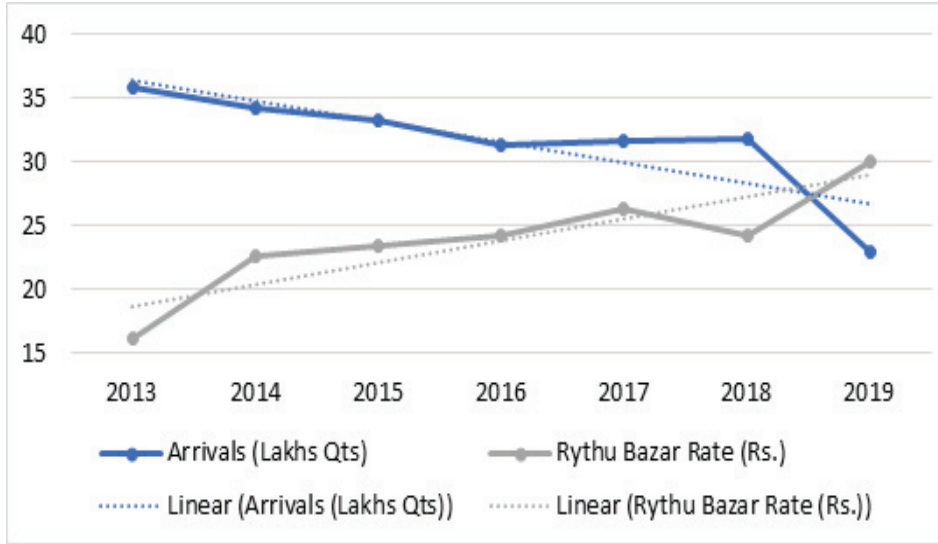
Table 4. Total arrival of vegetables in Rythu Bazaars as Percent of Total Production during 2018-19

S. No	Districts	Vegetables Arrivals (MT)	Vegetables Production (MT)	Percent (%)
1	Adilabad	4264	96199	4.43
2	Karimnagar	5420	40186	13.49
3	Khammam	22203	46446	47.80
4	Mahbubnagar	24029	89363	26.89
5	Medak	14821	79013	18.76
6	Nalgonda	5150	94397	5.46
7	Nizamabad	5044	97331	5.18
8	Warangal	4728	150274	3.15
9	Urban Cluster	202484	711779	28.45
10	Total	288141	1404987	20.51

Source: Department of Agricultural Marketing, Government of Telangana

Rythu Bazaars are emerging as an important alternative in terms of the value of trade and percentage production captured by these markets. Prices being realised by farmers using the platform have also shown a continuously increasing trend. However, an area of concern is the continuous decline in arrivals in such markets (Figure 3).

Figure 3. Status of arrivals and prices in Rythu Bazaar



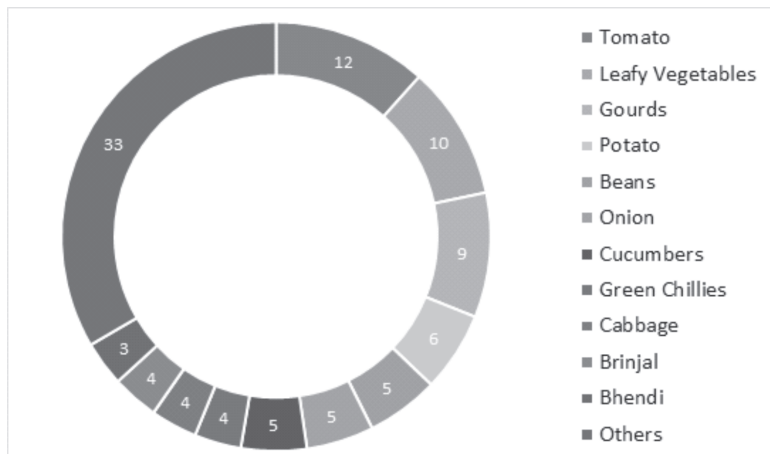
Leading vegetables arriving in the Farmers' Market

A large number of vegetables are arriving in Rythu Bazaars as depicted in Table-5 and Figure-4. The variety of vegetables makes Rythu Bazaars an attractive place for consumers to visit. However, nearly half of the arrival is contributed by the leading six vegetables only, including tomato, potato, onion and leafy vegetables. The arrivals of different vegetables in different Farmers' Markets operating in Telangana have been depicted in Figure 4. The arrival of more than 30 types of different vegetables in the farmers market makes them an excellent platform for farmers to market their produce. However, these markets have turned out to be a major platform for some leading vegetables like tomato, leafy vegetables, gourds, potato, beans and onion contributing nearly 50 percent of the total arrivals in the markets.

Table 5. State Level Arrivals of Different Vegetables in Rythu Bazaars During TE 2019

S. No	Vegetables	Vegetables Arrival (MT) TE 2019	Percent (%)	Cumulative Percent Arrival
1	Tomato	33408	11.61	12
2	Leafy Vegetables	29026	10.09	22
3	Gourds	27059	9.41	31
4	Potato	17341	6.03	37
5	Beans	15737	5.47	43
6	Onion	14620	5.08	48
7	Cucumbers	14209	4.94	53
8	Green Chillies	10135	3.52	56
9	Cabbage	10129	3.52	60
10	Brinjal	10125	3.52	63
11	Bhendi	9733	3.38	67
12	Others	96128	33.42	100
	Total	287649	100.00	100

Figure 4. Proportion (%) of Different Vegetables Arriving in Rythu Bazaars of Telangana



Benefits of Farmers Market

Rythu Bazaar has shown the potential to provide an alternative marketing channel to farmers mainly cultivating vegetables. The major benefits as perceived by the farmers are price realization, direct contact with consumers and availability of sheds in the same order as indicated during the interaction with different farmers visiting Siddipet Rythu Bazaar. Overall, some of the benefits as perceived by farmers under different categories are presented in Table 6.

Table 6. Benefits as perceived by farmers visiting Siddipet Rythu Bazaar

Price	Market	Convenience	Facilities
▪ Better price realisation ▪ Uniform price ▪ No need to bargain	▪ Availability of customers ▪ Interaction with customers ▪ Establishing relations ▪ Availability of facilities like cold stores	▪ Clean ▪ Protection from sun ▪ Total crop sale ▪ Location	▪ Sheds ▪ Water ▪ ATM ▪ Food availability

Though, the concept is full of potential it is not free from challenges. As the Siddipet market is developed in a multi-story format, many farmers suggested the need for a lift to facilitate the movement of commodities over different floors. Another limitation as expressed by farmers related to the availability of sheds. Though there are sufficient sheds available in the market, still, many times either the sheds are not available to all the visiting farmers or if available not of the farmer's choice. Availability of transportation facilities has also been highlighted as one of the limiting factors, by visiting farmers.

Conclusion

Locally grown food has created interest in the consumers for attributes like freshness and quality. Local food systems have the potential to influence price realisation by farmers, develop the labour market and improve local economics. The Government has introduced a number of policy initiatives in the agricultural marketing sector like reforms encouraging provisions such as direct marketing and farmers' market and subsidy based schemes to

strengthen infrastructure. Direct marketing of local food products has the potential to increase farm income (Brown, 2003). State governments are expected to create facilities for developing local food systems by adopting appropriate strategies covering farmers' market. State governments may also avail benefits available under various schemes of the Government of India mainly with focus on Infrastructure development.

Realising the importance of direct interaction between the farmer and the consumer, the concept of farmers-market with different names has been introduced by various states like Punjab, Tamil Nadu, Odisha, Maharashtra, Telangana and Andhra Pradesh. In order to encourage consumption of fresh produce at the local level, the concept of farmers market is being implemented as Rythu Bazaar in Telangana. The basic analysis of the information on Rythu Bazaar in Telangana suggests that the availability of consumers may be a defining factor in the success of farmers-market as two-thirds of the total trade taking place in the case of Rythu Bazaar in Telangana is coming from consumption hubs like Hyderabad and Ranga Reddy. These markets have also shown their effectiveness in prompting local food systems as suggested by their ability to attract local production. Though, the concept has shown its potential to encourage the local economy, it will require an understanding of local as perceived by the consumers along with other attributes that influence their purchasing decisions in the local context. As the Rythu Bazaar offers a potential market mainly for vegetable growers locally and vegetable crops can also offer better returns in comparison to traditional crops, the Government may encourage the farmers to take up cultivation of vegetables as per the requirement of consumers in the farmers market. The concept of farmer-market for its ability to provide market access, attract local production and better price realisation has the potential to encourage local food systems.

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Role of MANAGE FPO Academy in the Formation and Implementation of Farmer Producer Organizations (FPOs) in India

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Abstract

Aggregation of farmers into Farmer Producer Organizations (FPOs) is found to be an effective tool and appropriate mechanism for addressing most of the problems faced by small and marginal farmers in India. There have been a number of interventions to aggregate smallholders by the government, by private and civil society organizations. These include self-help groups, commodity interest groups, contract farming, direct marketing, farmer producer organizations, etc. However, aggregation models have failed to achieve the desired results. Hence, Government of India has come up with the policy to promote new generation Farmer Producer Organizations under its flagship programme of promoting 10,000 such FPOs over the next five years. In implementing this huge task, capacity building is one of the major components wherein, MANAGE has been identified as one of the Institute for implementing this component. In order to achieve this target, MANAGE will support the Government of India. Hence, the National Institute of Agricultural Extension Management (MANAGE) has set up "MANAGE FPO Academy. This paper focuses on the objectives of this Academy, its role in the formation and implementation of FPOs in India, activities and future strategy.

Keywords: Farmer Producer Organization, FPO, FPO academy.

Introduction

The focus of the government policies in the recent past has been on enhancing farmers' income through a flagship program of "Doubling of Farmers Income by 2022". One of the main strategies suggested in this document is the aggregation of farmers into Farmer

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Producer Organizations (FPOs) (GoI, 2018). This tool of aggregation is found to be an effective solution and appropriate mechanism for addressing most of the problems faced by small and marginal farmers, such as high cost of production, lack of access to technology, credit input and market. Aggregation of farmers into an FPO is not a new policy in India. Aggregation of farmers into cooperative groups is a century old intervention. These cooperative groups, no doubt, induced some good practices in the field of agriculture. By and large, the experiences of the performance of cooperatives have been poor with an exception of co-operative sugar factories and dairy cooperatives in Maharashtra and Gujarat (Paty and Gummagolmath, 2018). Apart from these cooperatives, Amalsad cooperative Society for sapota and farming co-operative (Gambhira) in Gujarat, MAHAGRAPES in Maharashtra, HOPCOMS and CAMPCO in Karnataka, Mulkanoor women cooperative groups in combined Andhra Pradesh etc., have performed well. There are also a few successful women's farming groups in Andhra Pradesh. These successful models could not be emulated in other regions of the country.

Various other institutional interventions, formal or informal, have tried to aggregate smallholders to link them to the input and/or output markets as a part of extension reforms. These interventions were started either by the government or by private corporate and civil society organizations. These include agricultural self-help groups, commodity interest groups, contract farming, direct marketing, farmer producer organizations, etc. However, all these aggregation models failed to achieve the desired results. These models were able to address one or two components of the supply chain in agriculture. Hence, the Government of India came up with a new tool of aggregation known as Farmer Producer Companies (FPCs).

These new generation of FPOs were designed and envisaged in such a manner that they are able to address all the issues in the supply chain of agriculture including marketing, processing and exports. As a result, farmer groups were allowed to register under the Companies Act by amending it during 2002 as recommended by Prof. Y.K. Alagh Committee. These new generation FPOs are a blend of cooperative principles and business professionalism provided in the Companies Act. They are managed by the BoDs and run by management professionals i.e. CEOs. They provide for the contribution of capital by the members and have provision for sharing of profits.

However, in the initial period, the growth of FPOs was slow. It attained momentum from the year 2013 when GoI declared the year as 'Year of FPOs'. Since 2002, around 9000

FPOs have been promoted by various agencies to date. Hence, based on the importance and success of this model in the country, the Govt. of India has decided to promote 10,000 FPOs over the next five years. It is estimated that the promotion and implementation of 10,000 farmer-organisations would require capacity building of nearly 46 lakh stakeholders covering Board of Directors, Chief Executive Officers (CEOs), Bankers and Community Based Business Organizations (CBBOs), officers from agriculture and line departments, resources from Non-Governmental Organizations (NGOs), State Agricultural Universities (SAUs), Cooperative organizations, apex institutes dealing with agriculture and other institutes including stakeholders in the private sector. To address this huge challenge of aggregating farmers, the National Institute of Agricultural Extension Management (MANAGE), an organization under the aegis of Ministry of Agriculture and Farmers Welfare, Government of India has setup an academy namely "MANAGE FPO Academy" with effect from 01st January 2021.

Objectives:

The FPO academy has been initiated with the following objectives

i. To organize capacity building of different stakeholders covering the Board of Directors, CEOs, Bankers, CBBOs, officers from agriculture and line departments, resource persons from NGO, Universities and other institutes including the private sector.

ii. To undertake research on different aspects of promotion, formulation and strengthening of farmer-organisations

iii. To provide policy advocacy to the government based on the research findings and feedback received from the field.

iv. Evolve different methodology/ models to facilitate FPOs linking with emerging marketing channels and export markets

v. Documentation and dissemination of success stories to different stakeholders. The Academy will also imbibe good practices of FPOs in other countries and act as a repository of international knowledge

vi. To provide consultancy in different areas of Farmer Producer Organisation

Organogram of FPO Academy

The Farmer Producer Organisations will have to work in an environment having participation of a wide range of players covering central and state governments, departments, universities,

NGOs and corporates. Accordingly, the MANAGE-FPO Academy is envisaged to be implemented in a Public Private Partnership (PPP) mode. The responsibility to execute different activities will be vested with the Centre for Monitoring and Evaluation of Programs and Plans (M&E), MANAGE. This centre will work in collaboration with nine other academic centres operating in MANAGE having expertise in different areas (Fig-1). The Academy will partner with different public and private institutes for execution of different activities of the Academy, mainly capacity building of different stakeholders. The Academy will also seek the association of different private institutes as Knowledge Partners covering agribusiness companies, corporates, NGOs, state-level federations, etc.

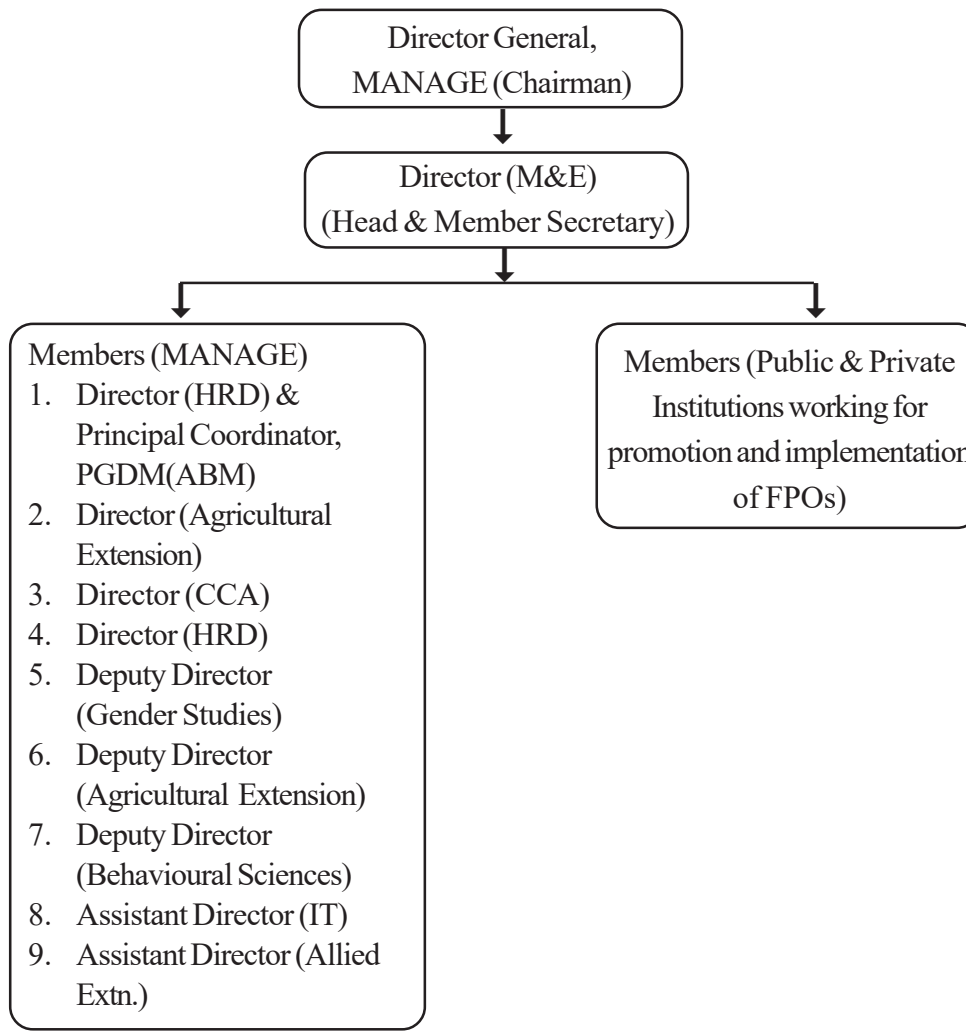

Figure-1: Organogram of MANAGE FPO Academy

i. Role of Academic Centres of MANAGE in FPO Academy

The National Institute of Agricultural Extension Management (MANAGE), an apex institution of the Ministry of Agriculture & Farmers' Welfare, Govt. of India was established in 1987 with an aim to provide management focus to the agricultural extension system. With its nine (09) centres which are formed based on different thematic areas, MANAGE undertakes training, research, education and consultancy services. Each centre is being managed by competent professionals (Fig-1). The role played by different centres as members of the academy is as follows

* M&E Centre- Lead centre responsible for overall coordination with different agencies and is responsible for implementation of various activities as envisaged under the fold of the academy

* MANAGE Academic Centres- Different centres of MANAGE will participate as partners as per their expertise and support the lead centre to cater to the subject specific needs of different stakeholders

ii. Role of different Partner Institutes

Different institutes operating under public and private sectors coupled with centres established at MANAGE will work in partnership to implement different activities visualised for the academy.

* Private players can participate in different activities of the academy as Knowledge Partners. There will not be any financial commitments and if funds are involved, case specific arrangements will be made by taking into consideration the mutual agreement of all the concerned partners. Private players can participate purely to share their knowledge and to facilitate the process of creation and development of farmer-organisations.

iii. FPO Academy Knowledge Partners: The details of the institutions /organizations/ federations/ banks/universities etc., who are enrolled as knowledge partners of FPO Academy are as mentioned below (Fig-2).

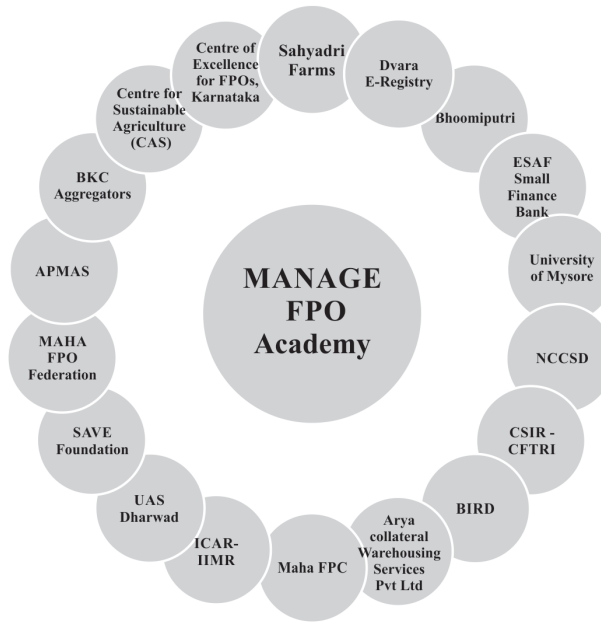

Figure-2: Knowledge Partners of MANAGE FPO Academy

1. Sahyadri Farmer Producer Company, Nashik, Maharashtra

Sahyadri Farms was registered in 2010 as a Farmer Producer Company, in order to solve the issue of scalability, farmer sustainability, and consumer benefit. It is 100 per cent owned by farmers alone who have equal voting rights regardless of their holding size.It is "India's largest Farmer Collective in Fruits & Vegetables Sector", which aims to ensure fair equity to everyone while providing value to the end consumer. Moreover, Sahyadri is India's largest exporter of grapes, largest tomato processor and procurer of tomato as well as the first producer company with Block Chain Technology.

2. Dvara E-Registry, Taramani, Chennai

It is a portfolio company of Dvara Holdings (formerly Dvara Trust) and part of the Dvara venture studio cohort that supports entrepreneurs working towards large-scale systemic change in financial inclusion. Dvara E-Registry ensures the sustainability and success of farmers and Farmer Producer Organizations through "Doordrishti", a platform that integrates FPOs and farmers through advisory services, digitization, market information, financial inclusion and insurance services.

3. Bhoomiputri, Bangalore

Bhoomiputri empowers women in agriculture through self-help networking structures across the country and helps agri entrepreneurs to gain a deeper understanding of the industry landscape thus helping them scale-up and sustain in the ecosystem It also encourages agri-entrepreneurship among the youth in collaboration with educational institutes and universities.

4. ESAF Small Finance Bank, Trissur, Kerala

ESAF small finance bank was set up in 2015 and started the commencement of business in March 2017. It has been initiated with the objective of "Fighting the Partiality of Prosperity" through strengthening the people at the bottom of the pyramid. Its main focus is on expanding the banking horizon to new unbanked/underbanked areas with its presence in urban, semi-urban, rural and rural unbanked areas.

5. CSIR - Central Food Technological Research Institute

It is one of the constituent laboratories under the aegis of the Council of Scientific and Industrial Research (CSIR) which came into existence during 1950. The institute pursues in-depth research and development in the areas of food science and technology and has developed over 300 products, processes, and equipment types with its resource centres at Hyderabad, Lucknow and Mumbai. It holds several patents and has published findings in reputed journals.

6. University of Mysore, Karnataka

The University of Mysore was established in 1916 and is the sixth oldest in the country and the first in the state of Karnataka. The university has a strategy to develop innovative programs in basic and emerging disciplines in a phased manner and with a commitment to involve the faculty and students in an interactive learning environment. Moreover, research activities in different fields of science and technology are also being conducted through various research centres.

7. Bankers Institute of Rural Development (BIRD), Lucknow

It has emerged as the premier institute offering training, research and consultancy services to its customers and undertaking other related activities in the field of agriculture and rural development banking. As an institute of excellence, BIRD is committed to impart quality education and practical knowledge on rural banking to young aspiring professionals. It also facilitates professional excellence in credit cooperatives and contributes to policy making process through research, propagation of best practices and other interventions.

8. Arya Collateral Warehousing Services Pvt. Ltd. Noida, Uttar Pradesh

It is an agribusiness value chain integrator from India which has a specific focus on catalyzing the ecosystem for smallholder farmers and FPOs through post-harvest interventions that include storage solutions, credit and risk guarantees, financial and market linkages and policy level changes. It is India's first agri commodity marketplace dealing with more than 20 commodities in 300 locations. Moreover, it has become India's first post-harvest solutions platform.

9. Maha Farmers Producer Company Ltd.(MAHAFPC), Pune, Maharashtra

MAHAFPC, a consortium of Farmer Producer Companies and an apex organization in the state of Maharashtra was incorporated in the year 2014 under the Companies Act 2013. The consortium is mainly involved in different marketing activities like establishment of forward and backward linkages, procurement of members produce through its registered FPCs, provides alternative marketing channels to the farmers by way of involving corporates and in all, it acts as a business facilitator to its FPCs.

10. University of Agricultural Sciences, Dharwad

Established in 1986, the university is involved in imparting education, research and extension activities. The university aims at imparting education towards the development of quality human resources in different branches of study as well as furthering the advancement of learning and conducting of research, particularly in agriculture and other allied sciences. Moreover, the University is promoting partnership and linkages with national and international educational institutions, Industries, research and other institutions.

11. ICAR-Indian Institute of Millets Research

It is a premier agricultural research institute engaged in basic and strategic research on sorghum and other millets under the Indian Council of Agricultural Research (ICAR).IIMR coordinates and facilitates millets research at the national level through All India Coordinated Research Projects (AICRP) on sorghum, pearl millet and small millets and provides linkages with various national and international agencies.

12. Andhra Pradesh Mahila Abhivruddhi Society (APMAS)

APMAS started its journey on 01st July 2001 in combined Andhra Pradesh with the purpose of strengthening the Self-Help Group (SHG) movement and livelihoods promotion. It has emerged as a trustworthy and credible resource organization at the state, national and international levels. It mainly works with SHGs and their federations, farmers organizations, cooperatives and other forms of Community Based Organizations (CBOs) as well as Self-Help Promoting Institutions (SHPI) who believe in and respect the spirit of self-help, and consider as a guiding principle for its work. APMAS works in three states, i.e. Andhra Pradesh, Telangana and Bihar.

13. BKC Aggregators

BKC aggregators is an agriculture technology company focused on using precision agriculture as a pivot to increase farming productivity and predict crop yields in advance of harvest. It has developed an App namely "Fasal Salah: A Farmer's Lifeline," which is India's only farmer level precision agriculture app. Met GIS Agro is the core platform technology developed by BKC which integrates crop data, weather forecasts, analytics and clients.

14. Centre of Excellence for FPOs, Karnataka

Centre of Excellence for Farmer Producer Organizations (CoE-FPO) was established for the overall development of FPOs in Karnataka and is promoted by the Karnataka State Department of Horticulture. CoE-FPO provides handholding and guides the FPOs to grow into effective business enterprises working for the socio-economic advancement of their member-farmers. It functions as an expert knowledge partner for FPOs and co-ordinates policies and programmes for sustainable FPO management, enhances

professional capabilities of FPO stakeholders through training, consultancy and research. Besides, it coordinates with development departments, farm universities, public and private institutes in strengthening activities pertaining to FPOs and promotes partnerships between the Government and civil society inclusive of various stakeholders of horticulture and allied sectors.

15. Centre for Sustainable Agriculture, Hyderabad

The Centre for Sustainable Agriculture works with small and marginal farmers to make agriculture economically and ecologically sustainable, build community institutions that can manage their livelihoods and improve governance of public policy in agriculture. CSA also conducts research on agro ecological farming methods and their impact, assists the farmers and consumers in successfully transforming to organic agriculture. CSA partners with different organizations and networks for a policy change to enable the promotion of sustainable models of food production and sustaining livelihoods engaged in the process.

16. Social Advancement Ventures (SAVe) Foundation

SAVe Foundation is a new generation social enterprise established in 2013 as a non-profit organization operating from Hyderabad, India. It works on various pressing issues of the society by establishing credible collaborations with People-Planet-Prosperity approach. Its approach is fully aligned with UN Sustainable Development Goals (UN SDGs). SAVe foundation is actively involved in areas like smart agribusiness, smart farmer enterprises (FPOs/FPCs), youth empowerment, agritech startups, women empowerment, village entrepreneurship, etc.

17. National Council for Climate Change Sustainable Development and Public Leadership (NCCSD)

It is an apex organization at the national level disseminating information and technology that will enable appropriate action and suggest policy frameworks to tackle impacts of global warming and climate change. NCCSD consolidates existing learning into a well-structured body of knowledge that can communicate suitable adaptation practices to strengthen locally relevant action for sustainable development.

Methodology

To achieve the set objectives, the academy organizes capacity building programs, collects primary and secondary information on successful FPOs in India, documents success stories, provides policy advocacy to the Government of India and other stakeholders on various aspects.

i. Capacity Building Programs:

The academy organizes need-based training programs / workshops for various stakeholders which include:

- Training of Trainers (TOT) programs to sensitize the extension officials in agriculture and allied sectors
- Training programs especially for Board of Directors (BODs) and members regarding the process of incorporation of FPO, registration process, share holding pattern, authorised & paid up capital, general body meetings, sanctions of loans, business plans, etc.
- Training CEOs on areas like management aspects, record maintenance, bank accounts, auditing, legal & regulatory aspects, etc.
- Training program for employees of FPOs on human resource management, accounting, marketing, consumer services, etc.

ii. Research & Documentation: To ascertain the performance, status and challenges faced by FPOs in India, various research studies are planned to be conducted across the country. In this regard, both primary and secondary information on organizational, functional, managerial and business aspects of FPOs will be collected and analysed followed by a report highlighting the key findings of the study and proposed strategies based on the research findings.

Furthermore, information on successful FPOs in different thematic areas like Women FPOs, organizations adopting sustainable agricultural practices i.e. organic/natural farming, FPOs in integrated farming systems, FPOs in dairy, fisheries and sericulture sector, etc.,

from across the country will be collected and documented as success stories. The main purpose of this activity is to capture the role played by the FPOs in enhancing farmers' income and to have clear visibility about its activities. This can become a learning tool for many farmers or nascent FPOs across the globe.

iii. Policy Advocacy: Most of the FPOs are facing a challenge of viability because of low paid-up capital. As per the study report by Azim Premji University, by the month of March 2019, only 7374 FPCs were registered with a total Paid-up Capital (PUC) of Rs.860.18 crore. However, 49 per cent of the registered PCs have a PUC of Rs. <1 lakh and it is also a matter of concern to note that the top 20 PCs contribute to more than 50 per cent of the total PUC across the world. This skewed distribution indicates that aggregation models are becoming successful mostly in the case of milk and the horticulture sector. The other challenges faced by FPOs are in terms of social capital. In most cases, there is a lack of awareness about the concept of FPOs and lack of quality leadership. Moreover, FPOs are facing challenges in terms of regulatory issues like statutory compliance requirements, lack of protection to the shareholders of Producer Company from Securities and Exchange Board of India (SEBI) as in the case of publicly traded companies and unavailability of reliable data for researchers and practitioners which is limiting them for designing future policy and interventions. Besides, complex compliance filing, there is lack of awareness about their eligibility for different schemes made available for cooperatives and individual farmers.

In view of the above facts, the FPO academy plays a crucial role in terms of policy advocacy to the Government of India and other stakeholders involved in the promotion of FPOs in various issues like the sustainability of FPOs, regulatory issues, impact studies and training need assessment etc.

Activities of FPO Academy

MANAGE has been organising a number of programs for different stakeholders of FPOs since 2013. So far, the institute has organised more than 100 programs covering over 3000 participants consisting of extension officers, CEOs, Board of Directors and Members of FPOs in the country. MANAGE has also documented case studies, research studies and policy papers on different aspects of FPOs. These programs serve as a platform for sharing different aspects of FPO and for facilitating interaction with the experts available

with the institute and experts from other organizations. The major activities carried out in FPO Academy are mentioned below.

Capacity Building Programs: In order to sensitise the stakeholders various workshops, national seminars, training programs, webinars and buyer-seller meets were organized in both physical and virtual mode. As on 31st December 2021, 16 capacity building programs were organized on the following aspects (Details may be seen in the Annexure).

- A three-day training program on issues and challenges in formation, management and implementation of FPOs was organized to deal with the concept of FPO, legal provisions governing producer companies in the Companies Act, finance, accounts and auditing etc.

- Collaborative Training for Chief Executive Officers of FPOs was conducted for existing and aspiring CEOs

- A webinar on "Opportunities for Farmer Producer Organizations (FPOs) in the New Regime of Marketing Reforms" was organized in order to sensitize the stakeholders of FPOs with respect to the national policy for the promotion of FPOs and various marketing opportunities for FPOs were explained. Moreover, case studies related to marketing strategies adopted by women FPOs as well as the journey of Sahyadri farms, the largest farmers collective of horticultural commodities in India were dealt with in detail.

- An online webinar on linking FPOs with e-NAM was conducted for stakeholders in the state of Karnataka in which ways and approaches to link FPOs with markets were dealt.

- A Training programme on Promotion and implementation of Farmer Producer Organizations in Maharashtra was conducted in Marathi for effective reach among the farmers in the state

- Linking FPOs to market in Andhra Pradesh was another program wherein the participants were informed about various concepts like ways and means of linking FPOs to markets, integration of FPOs to eNAM Market in Andhra Pradesh.

- A training program for the Board of Directors (BoDs) of Farmer Producer Organizations (FPOs) in the state of Haryana was conducted to impart training on the preparation of a business plan, accounting and social capital. A detailed session on financial aspects of FPOs and credit linkages with financial institutions was delivered by Samunnathi, an NGO. Besides, the establishment of an efficient value chain system and market linkages, promotion of exports and a few success stories of FPOs were a part of this program.

- A two-day consultative workshop on linking selected FPOs to the market was organized in Andhra Pradesh to discuss the concept of model FPOs, agribusiness models for FPOs in Andhra Pradesh, Scheme of Fund for Regeneration of Traditional Industries (SFRUTI) for linking FPOs to the market. The representatives of FPOs expressed their constraints and challenges faced by them i.e., registration process, financial issues, infrastructure and market linkages.

- A training program on Promotion of FPO in livestock sector: Opportunities and Challenges was conducted by the Centre for Allied Extension, MANAGE.

- Training on Climate Change and Natural Resource Management for Sustainable Agricultural Development for the FPOs was organized by the Centre for Climate Change and Adaptation, MANAGE.

- A program on strengthening agricultural extension through participation of FPOs was organized in Punjab to create awareness on incorporation process of FPC, various legal issues pertaining to FPCs, supporting agencies as well as various extension strategies for aggregation of farmers and in turn linking the farmers to markets.

- A training program was organized on linking farmers to futures trading, wherein the extension officials were trained by resource persons exclusively from NCDEX Institute of Commodity Markets and Research (NICR) in various aspects related to commodity markets, hedging, speculation, price analysis, commodity transactions that take place in futures trading and strategies for on boarding FPOs in derivatives.

- One Day Buyer - seller interface was organized for Farmer Producer Organizations & agribusiness firms in Vishakhapatnam district of Andhra Pradesh to provide a platform for the selected FPOs to interact with the agribusiness companies for procurement of agricultural commodities and value chain solutions in project districts.

- A national level orientation program was organized for all the stakeholders of FPOs to sensitize them on Agriculture Infrastructure Fund Scheme. The features of the scheme and process of registration by the beneficiaries, eligible projects that can be availed under the schemes were explained in detail.

Besides, need based meetings were conducted by MANAGE with the knowledge partners of FPO Academy and various experts. The suggestions given by the experts from time to time are as follows.

a. There is a dire need to identify FPOs in the selected clusters and strengthen them with regard to quality testing of the produce and identifying the traders for feasible marketing. More emphasis should be on branding of the produce from FPOs.

b. Construction of warehouses, mini/micro cold rooms at FPO premises can be useful for storage of small quantities of produce to reduce the operating cost. The importance of capacity building programs for strengthening FPOs in various aspects was highlighted.

c. More focus should be on sustainability of FPOs across India and challenges faced with regard to governance of FPOs. Moreover, FPOs in organic farming may be promoted to produce quality food.

d. With regard to marketing, an institutional linkage between FPOs and agribusiness firms has to be established. Moreover a benchmark survey is to be conducted in identification of FPOs and their approaches towards integrated supply chain and value chain.

e. Mapping of commodity specific existing FPOs followed by their value chain mapping should be done. However, a proposal on linking RAWE program with FPOs was also one of the major suggestions.

f. Improving storage structures with the support of the Government and further, the experiences from successful FPOs can be taken and imparted for further action.

g. The prospective marketing of FPO needs to be critically understood. The end-to-end value chain needs to be considered and emphasis should be given on marketing. For this, what needs to be done is to first identify potential buyers, then map the buyers and find out their requirements in terms of quantity and quality, later build up their capacity to meet the requirement and then connect the buyers. Followed by this a market survey for the ecosystem to identify the gaps on the production and marketing side should be done. Moreover, the IT cell Digital platform like Kalgudi can be roped in and available schemes should be integrated, and convergence with line departments has to take place. It was also suggested to focus on three important gaps viz., infrastructure, finance and capacity and on the maintenance of accounts, audit and compliance of company act. At the district level persons from service providers (technology/finance, etc.) can be trained by MANAGE for greater sustainability for greater success. A horizontal integration is needed instead of vertical integration. An integrating platform with the start-ups across the value chain is necessary.

• **Research & Documentation:** The academy undertakes research on different aspects of promotion, formulation and strengthening of farmer-organisations. However, to capture the overall performance of FPOs in agriculture and allied sectors, both primary and secondary information was collected from respective organizations regarding various activities, interventions, strategies followed by the producer organizations across India.

The primary data was collected from NGOs or promoters of FPOs, CEOs, BODs and farmer members through telephonic interviews with the help of well-structured questionnaires. The secondary information was collected from different published sources and official websites of concerned FPOs. Thus, a wide range of data has been collected from different FPOs promoted in agriculture, horticulture, dairy, poultry, fisheries, livestock sector and exclusively women-owned FPOs.

The collected data has been analysed and documented as case studies/success stories. Moreover, videos with respect to successful FPOs are also made available in the FPO academy. Besides creating awareness about managerial and organizational aspects of

FPOs among different stakeholders, these case studies were presented in the capacity building programs organized especially in the academy. Moreover, these success stories are disseminated to different stakeholders across the country.

An extensive study was conducted in the state of Maharashtra to assess the impact of Famer Producer Companies (FPCs) on the socio-economic conditions of the farmers. Primary data was collected from BoDs, farmer members, and employees of twenty FPCs selected for the study. The findings of the study revealed the business activities carried out by FPCs, various constraints and challenges faced by them, the role of directors in strategic planning, benefits received by the farmers after being a member in FPC and a few human resource aspects pertaining to the employees of selected FPCs. Based on the findings of the study, a few strategies and recommendations were suggested. The findings along with the recommendations were documented and released as a book.

• **Policy advocacy** to the government based on the findings of the research study and feedback received from the field. The Ministry of Agriculture and Farmers Welfare (MoA&FW) has requested MANAGE to conduct a quick study for developing guidelines for the scheme meant for the promotion of 10,000 FPOs in India. MANAGE has completed the study and shared the same with MoA&FW. A few suggestions from the outcome of the study were a part of the guidelines for promotion of FPOs.

• **Support** is extended to FPOs in the form of identifying the model FPOs and facilitating their linking with emerging marketing channels and export markets. Moreover, the selected FPOs in the state of Andhra Pradesh were supported under the Scheme of Fund for Regeneration of Traditional Industries (SFURTI).

Future Strategies of Academy

In view of the promotion of 10,000 FPOs, the Government of India has estimated that around 49 lakh different stakeholders need to be trained. In this direction, MANAGE FPO Academy is planning to play a bigger role as an apex body. In this direction, MANAGE has planned capacity building programs at different levels. MANAGE has its presence across the country and its constituents like SAMETI will be involved in training of trainers like extension officials from the department of agriculture and allied sectors and Agricultural Technology Management Agency (ATMA) in training FPO's Board of Directors, farmer members and other stakeholders.

Capacity building and training of different stakeholders of FPOs including BoDs/Leaders of FPOs, and CEOs is the need of the hour. In the guidelines for promotion of 10,000 FPOs of Government of India, it is asserted that Institutions may devise certificate/diploma courses to train "barefoot managers/ CEOs". Such courses need to be institutionalised and developed by concerned institutions viz., agricultural universities, entrepreneurship development institutions, NIAM, BIRD, NIFTEM, MANAGE, VAMNICOM, etc. with Sector Skill Council accreditation.

Capacity building, training and skill development of CEOs/ BoDs and other stakeholders identified by nodal training institutions, in consultation with DAC&FW, through transfer of technology, innovation, is very essential for development of robust FPOs and for running the business activities successfully on a self-sustainable basis. The subject matter of training should cover topics ranging from organisational management/behaviour, crop husbandry, value addition, processing, marketing, trading, export, supply chain, grading, branding, packaging, accounting, auditing, compliance requirements, incubation, ICT & MIS as may be relevant for promotion of FPOs including case studies in best practices if any.

The Bankers Institute of Rural Development (BIRD), Lucknow, promoted by NABARD is designated as the Nodal Training Institution at the central level for FPOs promoted by NABARD and SFAC and other allowed/designated Implementing Agencies. It was proposed in the new guidelines that BIRD will work in partnership with other reputed organisations like NIRD, MANAGE, NIAM, NIFTEM, VAMNICOM and such other national and regional institutions such as IRMA, Anand and ASCI, State and Central Government, Agricultural Universities, National Level Skill Development Universities, KVKs and other National Level Management and Skill Development Institutions, etc. BIRD, in consultation with NABARD and DAC&FW, will prepare a training module and training schedule for the ensuing year, which will be put forward for approval by National Level Project Management Advisory and Fund Management Committee (N-PMAFSC). In this regard, MANAGE prepared a proposal and shared it with BIRD along with the cost of training at different levels.

Laxmanrao Imandar National Academy for Co-operative Research & Development (LINAC), Gurugram promoted by NCDC is designated as Nodal Training Institution at central level for FPOs registered under the Co-operative Societies Act and promoted by NCDC. LINAC will work in partnership with other reputed national and regional training institutions like NIAM, VAMNICOM, MANAGE, NIRD, NCCT, IRMA, ASCI, State

and Central Agricultural Universities, KVK, reputed National level Management and Skill Development Institutions/Universities, etc.

In the light of two national nodal agencies i.e., BIRD for FPOs promoted under companies act and LINAC for FPOs promoted under cooperative sector, there is a need for convergence of agencies to fulfil the capacity building needs for the upcoming 10,000 FPOs. Well-coordinated activities under a single platform of convergence will ease the mandate of capacity building of an estimated 48 lakh stakeholders in the process of formation of 10,000 FPOs.

Understanding the importance of the subject and the kind of focus required to reach a large number of stakeholders, MANAGE FPO Academy has initiated, with a long term objective, to act as a 'one-stop solution' for all the issues related to promotion and implementation of FPOs. With the help of the wide network of institutes and expertise available, MANAGE can take up any task of capacity building of FPOs. Accordingly, a decision was taken in the Executive Council meeting of MANAGE to have a meeting between the apex agencies involved in the capacity building activities in the agriculture and allied sector.

As far as research is concerned, MANAGE is planning to have a comprehensive database and there is a plan to document a large number of success and failure stories on a case study mode which will act as inputs for policy advocacy. However, based on research conducted in the academy, time to time policy advocacy will be given by MANAGE to GoI on sustainability of FPOs and regulatory issues faced by them. Moreover, FPOs are still facing issues related to their formation and incorporation at the national, state and district level. Hence policy advocacy will be given on these issues as well.

The academy in the long run will continue the activities in tune with any policy changes by the Government of India and will try to address issues related to formulation and registration of FPOs, legal issues and issues related to sustainability of farmer-organisations. For wider and comprehensive coverage of different aspects of FPOs, the efforts of the academy will coordinate with other public and private institutes.

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Annexure

Progress of Activities in MANAGE FPO Academy

S. No	Title	From	To	Venue	No. of participants
1)	Issues and Challenges in Formation, Management and Implementation of FPOs	05/04/2021	08/04/2021	MANAGE (Virtual)	27
2)	International Webinar on Opportunities for Farmer Producer Organizations (FPOs) in the New Regime of Marketing Reforms	27/04/2021	27/04/2021	MANAGE (Virtual)	176
3)	Collaborative National Seminar on" Agricultural Marketing System in India towards online marketing	29/05/2021	29/05/2021	MANAGE (Virtual)	286
4)	Training program on Promotion of FPO in livestock sector: Opportunities and Challenges	15/06/2021	17/06/2021	MANAGE (Virtual)	198
5)	Webinar on Linking FPOs with e-NAM in Kannada for Karnataka State	18/06/2021	18/06/2021	MANAGE (Virtual)	63
6)	Webinar on Promotion and Implementation of Farmer Producer Organizations in Maharashtra	29/06/2021	29/06/2021	MANAGE (Virtual)	141

7)	Training Progamme on Linking FPOs to Market in Andhra Pradesh	27/07/2021	29/07/2021	MANAGE (Virtual)	21
8)	Training Program for Board of Directors (BoDs) of Farmer Producer Organizations (FPOs), Haryana	29/07/2021	31/07/2021	Horticulture Training Institute, Karnal, Haryana	38
9)	Consultative workshop on Linking Selected FPOs to Market in Andhra Pradesh	06/08/2021	07/08/2021	Andhra Pradesh	65
10)	Approaches to Link FPOs with Market	24/08/2021	26/08/2021	MANAGE (Virtual)	38
11)	Climate Change and Natural Resource Management for Sustainable Agricultural Development for the FPOs	24/08/2021	26/08/2021	MANAGE (Virtual)	27
12)	Training Program on Supply Chain Management and Market Linkages for Agriculture and Horticulture Produce	20/09/21	22/09/21	MANAGE (Virtual)	38
13)	Training Program on Collaborative Training to CEOs of FPOs promoted by ICAR-IIMR	27/09/2021	30/09/2021	MANAGE Hyderabad	48
14)	One Day Buyer - seller interface for Farmer Producer Organization in Andhra Pradesh	15/11/2021	15/11/2021	RARS, Anakapalli, Visakhapatnam	55
15)	Training Program on Linking Farmers to Futures Trading	09/11/2021	11/11/21	MANAGE (Virtual)	39
16)	Training program on Strengthening Agricultural Extension through participation of FPOs,	22/11/2021	25/11/2021	Online PAMETI, Ludhiana, Punjab	30

'ZYNGBADPA' an Effective Communication Tool in Cold Arid Ladakh

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Sonam Angchuk[5]

Abstract

In recent years, Information and Communication Technologies (ICTs) have emerged as effective tools for the dissemination of information on a large scale to a large number of people. ICT is a broad term that encompasses simple mobile phones to computers and to satellite imageries. The use of ICTs can help to provide timely information to the farmers about the weather, outbreak of disease, crop management and market prices of various commodities. This paper illustrates how a simple device like a smart phone can serve the farming community. By creating a WhatsApp group 'ZYNGBADPA', an array of diverse farming services from relevant advice and timely information regarding inputs, diseases and insect pest management to the weather condition and weather based agro advisories and from market information to marketing support is being provided to tribal communities in Leh district of Ladakh region. 'Zyngbadpa' in Ladakhi language means one 'who works with the land', i.e. a farmer.

Keywords: ICTs, WhatsApp, ZYNGBADPA

Introduction

India is predominantly an agrarian economy. According to a report by NITI Aayog (2017), about 69 per cent of the population lives in rural areas. Another report of the Press Information Bureau (2010-11) reveals that the share of the workforce in agriculture stood at 54.6 per cent. The country is dominated by marginal and small farmers. About 85

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per cent of the farmers have land below or up to 2 hectares (Census 2010-11). Timely and accurate information to the farming community and other stakeholders regarding different inputs, market price, weather, government policies, latest technologies, climatic aberrations, value addition and other related and relevant technologies is a prerequisite for enhancing agricultural production as well as augmenting the income of farmers in the country. This extensive task of fulfilling information needs cannot be accomplished with human force alone. The public extension service in the country is already paralyzed with multiple issues like low extension workers to farmers' ratio, multiple roles of the extension agency, lack of accountability and many others. The ratio of extension workers to farmers in the country stands very high at 1:1162 as against the recommended ratio of 1:750 (Nandi and Swamikannu, 2019). Of the 40.6 per cent households who received extension assistance, only 11 per cent of the services came from physical government machinery i.e., extension agents, Krishi Vigyan Kendras (KVKs) and State Agricultural Universities (SAUs) (NSSO, 2014). This calls for an immediate revival of the traditional methods and the use of some innovative techniques for information delivery. In the present era ICT has emerged as the strongest tool for more efficient, time and cost saving information delivery.

According to the Food and Agriculture Organization (FAO, 1993), ICT is defined as those technologies used in collecting, processing, storing, retrieving, disseminating, and implementing data and information using microelectronics, optics, and telecommunication and computers. Low-cost Information and Communication Technology (ICT) tools promise the ability to deliver timely, relevant, and actionable information to farmers throughout the world, at dramatically lower costs than traditional extension services (Aker, 2010; Cole and Fernando, 2012, World Bank, 2016). Among the various ICT tools, WhatsApp offers a futuristic scope for access to a diverse range of information needed in agricultural production. There exists an ample opportunity to utilize WhatsApp for agricultural extension activities. It is a form of a social media tool that enables people to access many types of conversation and share information and facilitate discussion (Andres and Woodard, 2013). In addition, the Indian Council of Agricultural Research (ICAR) and the Krishi Vigyan Kendras (KVKs) have developed 145 mobile apps for farmers (Singh, A.K 2019). The study by Naruka et al 2017 indicated that by the use of WhatsApp farmers are able to seek information on farm operations, clarify their doubts on plants/ livestock disease symptoms and are having immediate access to market related information.

Locale of the Study

The Union Territory of Ladakh is often called cold desert (Shafiq, et.al 2016). Wide diurnal and seasonal fluctuations in temperature are observed with -40°C in winter and +35°C in summer. Precipitation is very low mainly in the form of snow. The air is very dry and relative humidity ranges from 6-24 per cent. The entire area is devoid of any natural vegetation. Irrigation is mainly through channels from the glacier-melted snow. Villages are scattered, isolated and largely inaccessible. Under such a scenario, owing to the difficult terrain of the region and very harsh weather during winters, providing timely information to the farming community in this region by being physically present there with the farmers was a challenge for extension functionaries. To overcome this, a WhatsApp group 'ZYNGBADPA' was created by Dr. Parveen Kumar, SMS Ag. Extension at KVK-Leh to provide timely and relevant information to the farmers located in remote inaccessible areas of the region. The WhatsApp group 'ZYNGBADPA' is serving about twenty villages of Leh district in the Union Territory of Ladakh providing agriculture related information, weather related agro-advisories, market information, diagnostic services, marketing support and many other services. 'ZYNGBADPA' has allowed mass communication to be interactive. Anyone can upload his/her problems, opinions, and suggestions and communicate with many others at a time.

Materials and Methods

Farmers from twenty villages of Leh district are members of the 'ZYNGBADPA' group. The villages include Stakna, Stok, Matho, Chuchoot, Choglamsar, Sakti, Spituk, Chemday, Kharu, Gya, Takmachik, Saspol, Domkhar, Martselang, Phyang, Nimoo, Hemis, Shey, Digger, and Tayakshi. It has been ensured that at least two to three progressive farmers from each village are represented in this group. Farm women and youth have also been adequately represented in this group. About thirty per cent of the members in the group are women. The total strength of the group at present is 100.

Objective

The basic objective of creating this social networking tool was to ensure that relevant and timely information reaches the farming community and the problems of the farming community reach the KVK-Leh for their redressal. Through 'ZYNGBADPA', it is ensured

that farmers are taken care of; they stay connected with KVK-Leh and receive necessary communication.

'ZYNGBADPA'

CARING, CONNECTING AND COMMUNICATING IN THE COLD ARID

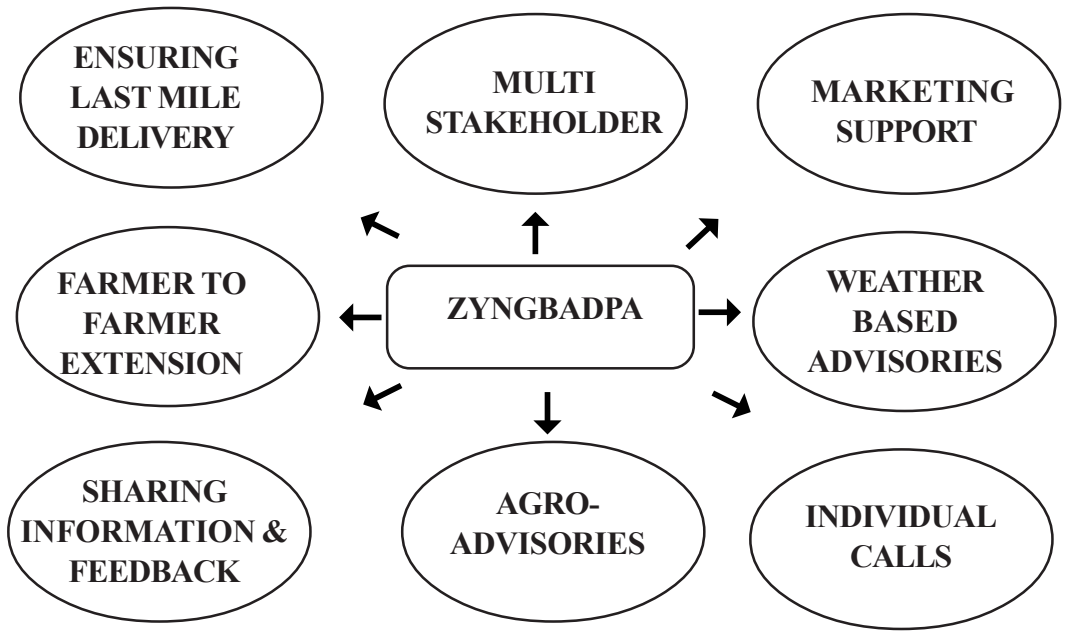

Fig.1: 'ZYNGBADPA' Model of Serving and Empowering Farmers'

Discussion

For a Krishi Vigyan Kendra, a district level body with a team of only six specialists and a limited supporting staff, it is very difficult to reach out to the farming community habituating in different parts of the district. In order to widen the reach of the KVK and to cover the farming community residing in remote inaccessible areas; 'ZYNGBADPA' was created in March 2020. The various pro-farmer activities carried out under 'ZYNGBADPA' are discussed as under:

a. Sharing information and creating awareness: Information related to different aspects of crop production, livestock, horticulture; different varieties developed, new technologies and information regarding various government policies and programmes is shared with the farming community. This helps them to improve their awareness which in turn has helped them to avail the benefits.

b. Responding to the queries: At 'ZYNGBADPA', all the queries of the farmers' are being immediately responded to. All that the farmers have to do is to post their queries in the group. They also click the picture of insect pests or any disease they found in their crops and post it in the group. This enables specialists to have a real assessment of the nature and intensity of the problem thereby arriving at the correct diagnosis and prescribing the appropriate treatment.

c. Farmer to Farmer Extension: Farmer-to-farmer extension is defined as the provision of training by farmers to farmers, often through the creation of a structure of farmer-trainers. The farmer trainers are recognized by different names like master trainer, lead farmer, farmer-promoter, community knowledge worker which implies a different role. In 'ZYNGBADPA' also many a times the solution to the problem of one farmer lies with the other farmer. Members of the group are also master trainers in different fields and provide training to other farmers and extension functionaries.

d. Marketing channel: 'ZYNGBADPA' is also a marketing platform for the farmers. Farmers place their orders in the group and those interested in selling their produce make it available for them. This marketing channel is free of any type of commission from either the seller or purchaser.

e. Weather advisories: The weather-based advisories are also a regular and weekly feature of this social networking site. The weather-based advisories enable the farming community to plan their agricultural operations accordingly

f. Agro-advisories: Regular agro-advisories on different crops including cereals, vegetables, fruit crops and livestock are provided to the farming community through this group. Besides, advisories on locust management, health and nutrition, sanitation, soil health and on many other aspects are also regularly given to the farming community.

g. Effective communication tool during COVID-19: 'ZYNGBADPA' also proved to be an effective tool during the COVID-19 lockdown. Regular advice was given to the farmers about the deadly nature of the virus and on how to contain the spread of the virus. The farming community was contacted through a Zoominar during the lockdown. Relevant literature regarding COVID-19 published in different newspapers was also posted in the group for the awareness of the farming community. During the lockdown when every type of movement was restricted, the scientific community was not able to physically reach them-'ZYNGBADPA' compensated for the physical absence. In the Ladakh region, when the lockdown was enforced, it was the time for preparing and sowing of nursery for vegetables. Through this medium farmers were regularly guided on different aspects of nursery raising. This ensured that the vegetable growers did not suffer.

h. Individual phone calls: Individual phone calls made to the farming community give them a sense of being cared for. They feel that there is someone who cares about them and stands with them in the hour of crisis. Farmers are called individually to know if they are facing some problem on their farm or livestock

i. Celebration of important days: As it is not possible to celebrate important days every time; 'ZYNGBADPA' has given a platform to celebrate important days through the online mode. On World Milk Day (June 1) an online photo contest was organized where the farmers were asked to post pictures of their milch animals in the group. Information about other important days is also shared with the farmers through this group

j. Involvement of all stakeholders: All the relevant stakeholders including officials from the Department of Agriculture, Non-Governmental Organizations working in the region, input dealers, youth and entrepreneurs are a part of 'ZYNGBADPA'. This helps the farmers to develop linkages with them and to strengthen the coordination amongst all.

k. Ensuring last mile delivery of extension services: 'Last mile delivery' means reaching marginal and small, inaccessible and resource-poor farmers with appropriate and timely advice and enabling them to access the inputs they require. 'ZYNGBADPA' ensures last mile delivery of extension services. It has stood with the farming community of the region in their times of crisis by providing relevant and timely information and inputs in the form of seed, seedlings, plant protection material and other items.

Conclusion

WhatsApp as a social media tool is simple and easy to use, has low internet data requirements, and is increasingly popular in rural India. Thus, it has a strong potential to be a viable agricultural extension tool for extension based organizations in general and extension educators, in particular. Worldwide, WhatsApp is the most popular messaging service in over 100 countries. WhatsApp has over two billion users worldwide, with 390 million in India alone (Iqbal 2021). It has become the most preferred mode of communication among the smart phone using farmers. One can share information in multiple forms ranging from text-based messages to audios, visuals; audiovisual and even web links making it an information enriched platform. In addition, information sharing is possible at any place and at any time without worrying about background disturbances. 'ZYNGBADPA' is a fundamental shift in the way communication occurs in this cold arid region and has brought KVK-Leh closer and within the reach of the farming community. It is both serving as well as empowering the farming community.

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FPO Ecosystem in India: Overview of Policy and Supporting Initiatives Across States

R.M. Prasad[1]

Abstract

The promotion of a large number of Farmer Producer Organisations (FPOs) should be seen as part of the larger solution in addressing farmers' problems, but not as the only solution in and of itself. It is not only important to promote FPOs, but also to provide them with better institutional support and governance mechanism to increase their chances of success, and simultaneously, work towards addressing the challenges facing the farmers. Though the input side interface of the Producer Companies (PCs) in most of the States is relatively better, impact on the output side and also on farmer income happens only in those States where suitable policy measures, convergence efforts and effective governance mechanisms are put in place. There is also a need to rope in more private players in the FPO ecosystem for improved performance and long term sustainability.

Keywords: Farmer Producer Organizations, Farmer Producer Companies.

Introduction

Since 2011, when the Government of India introduced the concept of Farmer Producer Organisations/Companies (FPOs/FPCs), they are being promoted under various schemes and initiatives of the Central Government, State Government, NABARD, and under Corporate Social Responsibility programmes of different private companies.

FPOs in India are financially supported by two main organizations, viz., Small Farmers Agribusiness Consortium (SFAC) and National Bank for Agriculture and Rural Development (NABARD). Recently, the National Co-operative Development Corporation (NCDC) is also roped in as another agency for the formation of FPOs (NCDC, 2021).

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FPOs create opportunities for producers to get involved in value supply chain activities such as input supply, credit, processing, marketing and distribution. FPOs can make the supply chain more efficient, help realize better prices, enhance competition, reduce malpractices, improve traceability, and enhance quality, besides bringing in other improvements.

An attempt is made in this paper to briefly review the policy and supporting initiatives adopted by 22 state governments to create a favourable and conducive ecosystem for the effective functioning of FPOs in India. This review may not be exhaustive and comprehensive covering all the policy and supporting interventions in different states.

State-wise Scenario

Andhra Pradesh

The Government of Andhra Pradesh (AP) has charted out a multipronged strategy comprising seven missions, five grids, and five campaigns for the overall development of the State. Among the seven missions, Primary Sector Mission (Rythu Kosam Mission) aims at achieving double-digit growth in agriculture and allied sectors. Rythu Kosam has identified FPOs as the appropriate institutional form around which farmers would be mobilized and their collective capacity of production and marketing can be leveraged by strengthening their capacities. Andhra Pradesh Farmer Producer Organisations Promotion Policy 2016 is formulated for this purpose.

The Department of Agriculture and Cooperation, Department of Animal Husbandry, Commissionerate of Fisheries, Commissionerate of Horticulture, Society for Elimination of Rural Poverty, AP State Cooperative Marketing Federation, and Andhra Pradesh Food Processing Society are part of FPO/FPC development in Andhra Pradesh. A Project Management Unit (PMU) is established within each department at Commissionerate/ Directorate level. The PMU is supported by a Project Support Unit (PSU) for strengthening the FPO agenda at the state level, assisted by ICRISAT-led consortium of organizations like Basix, Vrutti, WASSAN, etc. (Raju and Vani, 2016).

The Agriculture Technology and Management Agency (ATMA) plays an active role as a coordinating agency at the district level for the FPO agenda. ATMA coordinates with each department and also deploys a team of experts with professional expertise.

The Government of Andhra Pradesh has initiated 'Smart Agribusiness Platforms Network of Andhra Pradesh (SAPNAP)' through Andhra Pradesh Food Processing Society for Agribusiness Development enabling ecosystem. TechnoServe, a leading non-profit organisation has partnered with Walmart Foundation to launch a two-year Sustainable Livelihoods Program for smallholder farmers to transform 14 FPOs in Andhra Pradesh. (https://www.technoserve.org)

Assam

Considering the existing fertile soil and favourable climatic conditions in the North Eastern Region, the Ministry of Agriculture and Farmers Welfare, Government of India launched Mission Organic Value Chain Development for North Eastern Region (MOVCDNER) during the 12th Plan period. The scheme aimed at development of certified organic production in a value chain mode to build a bridge between growers and consumers and to support the sustainable development of the entire value chain.

Identifying the potential, ten clusters were formed in Assam, with a target to attain 500 ha of area in each, under the Department of Agriculture and Horticulture. The Directorate of Horticulture and Food Processing also worked on another ten additional clusters. All the selected clusters have formed a Farmer Produce Company among themselves to promote production and create a market of its own (https://agri-horti-assam.gov.in> schemes> farmer-producer -organisations-fpos).

The North East Regional Agriculture Marketing Corporation Ltd (NERAMAC) is involved in supporting farmers right from the fields up to the markets to the end consumers through registered FPO/FPCs. In August 2021, a Revival package of NERAMAC was sanctioned which will help to implement various innovative plans including post-harvest facilities to promote the products of NE farmers in the world market through participation in events, registration of GI products etc., promoting FPOs and other growers.

To boost the functioning of FPOs, a Consortium of Assam FPOs (CAFPO) was established in February 2020 in partnership with Self Reliant Initiatives through Joint Action (SRIJAN) India and in collaboration with FPO promoting organisations in Assam. SRIJAN believes in the power and capacity of community collectives to sustain developmental efforts. SRIJAN in collaboration with Civic Engagement Alliance has been

working in Assam on the Pathway - 3 program for the Strategic Partnership of Convening and Convincing for strengthening FPOs since 2017 (https://srijanindia.org).

Bihar

FPOs promoted by JEEViKA in Bihar have emerged as promising economic platforms in tackling the challenges of small farmer agriculture. JEEViKA, a Government of Bihar initiative for poverty alleviation, was initiated in 2006 with support from the World Bank. Four FPCs have been promoted under JEEViKA and all of them have been successful to varying degrees. Depending upon the commodity, these FPCs have adopted slightly different business models.

Aranyak Agri Producer Company Ltd., (AAPCL), Purnea disrupted the traditional system of maize marketing with village level Producer Groups (PGs) acting as aggregation and quality control hubs for harvested maize. Apart from being the first woman farmer producer company to register under the NCDEX and the NeML platform, the company was the first to introduce moisture meters at the PGs to ensure high quality in procurement.

Samarpan JEEViKA Mahila Kisan Producer Company Ltd., Muzaffarpur is a multi-commodity producer company engaged in aggregation and marketing of a wide variety of commodities including wheat, vegetables and litchi. The producer company is the first in Bihar to register under the fresh platform of NeML (NCDEX E Markets Ltd.) for the fruit segment.

The Govt of Bihar has launched Bihar Agri Investment Promotion Policy (BA-IPP) 2020, which includes dovetailing of incentives from other Central and State sponsored programmes/schemes, which will complement existing incentives under Bihar Industrial Investment Promotion Policy (BIIP), 2016. Bihar Horticulture Development Society (BHDS), Agriculture Department, Bihar is identified as the Nodal Agency. Agribusiness Investor facilitation desk will be established in BHDS to provide handholding support to the investors to ensure Ease of Doing Business. A State Investment Promotion Board (SIPB) is constituted for providing approvals and clearances on setting up of new businesses. Bihar government has provided for 25 per cent of the project cost as capital subsidy for FPOs as against 15 per cent for individuals, partnerships firms and LLPs provided the project cost is at least Rs. 25 lakh, and is credit-linked (http://www.udyogmitrabihar.in>sipb).

Chhattisgarh

In Chhattisgarh, NABARD, SFAC and Directorate of Horticulture and Farm Forestry, Chhattisgarh are the main agencies supporting FPOs. The highest number of registered FPOs was supported by NABARD followed by the Directorate of Horticulture and Farm Forestry Chhattisgarh state and SFAC with 43.85 per cent, 36.15 per cent and 20.00 per cent respectively. Most of the FPOs were promoted by the NGOs in the initial years. The Ford Foundation has placed a grant of USD 690,000 with the Client Fund of Rabobank Foundation to provide a guarantee to the Indian financial institutions that would lend to FPOs.

Chhattisgarh Holistic Indigenous Rural Advancement and Agriculture Project (CHIRAAG) funded by World Bank will be implemented by the Department of Agriculture Development and Farmers Welfare and Biotechnology, Government of Chhattisgarh. The CHIRAAG project in Chhattisgarh will lay the foundation for a diverse and nutritive food and agriculture system, mobilize smallholders into FPOs and increase incomes by improving their access to profitable markets (http://www.cgchiraag.com).

The component 'Value addition and Access to Markets' aims to increase household income through value addition, processing, equitable market access and reduced post-harvest losses. This will be achieved through forming FPOs and supporting them for aggregation, primary processing, value chain development in select commodities through public and private partnerships.

Chhattisgarh's rich biodiversity and diverse agro-climatic zones provide an opportunity to focus on an alternative model of development allowing the tribal-dominated southern region to leverage its natural resources, diversify and grow resilient crops; and assure a production system that takes care of the nutritional needs of every household. The project will be implemented in the state's eight districts, seven of them in Bastar division.

Gujarat

Most of the PCs in Gujarat emerged from some form of farmer collective as its promoter, whether it was Water User's Associations (WUAs) or Bharatiya Kisan Sangh (BKS). BKS has established Maha Gujarat Agri Cotton PC (MGACPC), the largest producer company in Gujarat.

The Development Support Centre (DSC) is a resource organisation which has facilitated a network of NGOs involved in promoting the NRM programme in Gujarat. This network named Sajjata Sangh has 22 NGOs and CSRs as its members. The Sajjata Sangh has set up a state-level consortium of FPOs in the name of Gujarat Farmer Producer Company (Gujpro).

Gujarat Rajya Krushak Manch (Gujarat State FPO Forum) is an initiative to facilitate Agribusiness and Agri-entrepreneurship among FPOs sponsored by SFAC and anchored by Sajjata Sangh, which plays a facilitator's role to the State FPO forum (http://sajjatasangh.org).

The state FPO forum is an apex body with subgroups that deal with business development, policy and procedures, institutional support, sub-sectors of agriculture like horticulture, animal husbandry, fisheries, honey collection, poultry etc., with any one of them or any number of them being registered or remaining informal.

The forum will be an informal body, to begin with, unless and until the committee decides to register it. This will give the forum space to define its purpose and evolve a plan of action. The FPO members will decide on the milestones to be reached and the timeline for it. The committee can independently set its agenda and proceed on it.

Shikshan Ane Samaj Kalyan Kendra (SSKK), a network NGO of Sajjata Sangh, active since 1980 in Amreli District of Gujarat, had established a farmers' collective titled 'Avirat Agro Business Producer Company Limited' (https://sskkamreli.org>avirat-agro). Avirat established an Agro Service Centre to facilitate the supply of quality pesticides at affordable prices. The Avirat Seed Foundation, which is a public-private partnership (PPP) between the state-owned Gujarat Rajya Beej Nigam (Gujarat Seed Corporation) and Reliance Industries, functions as a seed bank, providing low priced quality seeds especially for cotton, groundnut, castor, and cumin. Farmer members who require as little as half a bag of seeds have access to certified seeds from this seed foundation.

IFFCO Kisan Sanchar Ltd is setting up 17 FPOs in Gujarat in association with NABARD and NCDC (ET, 2021). Girimala Farmers Producer Company has been promoted by Reliance Foundation under the Integrated Rural transformation CSR project. Gradually, they have emerged to do business through spot market and futures market with the financial support of NABKISAN. They have initiated a spot market for soyabean as also trading through E-NAM and futures trading for castor.

Haryana

Small Farmers Agribusiness Consortium Haryana (SFACH) has assigned NABCONS the task of promotion and strengthening of FPOs in different districts of Haryana. SFACH has pioneered the formation and growth of FPOs and is progressing towards establishing an eco-system for FPOs to make them sustainable and viable by taking steps for Agro/ Food Processing, marketing and distribution sector. The Department of Horticulture and Haryana State Agricultural Marketing Board facilitate the production and marketing of farm produce by the FPOs.

Haryana has registered 125 FPOs on e-NAM portal for online trading of horticultural items. The Government has integrated three packhouses of FPOs on the e-NAM platform of the Government of India. Pack houses have been set up under the Crop Cluster Development Programme (CCDP) of the State Government.

Haryana Agri-Business and Food Processing Policy 2018 by the Department of Industries & Commerce, Government of Haryana covers the enterprises in Agriculture and allied sectors. Agro and Food Processing units, milk producers, fishery/poultry units, etc and FPOs are eligible to avail incentives in this policy (https://msme.haryana.gov.in/document/haryana-agri-business-and-food-processing-policy-2018/).

With the objective of strengthening the FPOs, MOU has been signed with 29 companies of 20 FPOs. These companies will link the FPOs directly to the market. The farmers need not sell their products in the mandi and other places. These companies will directly procure fruits, vegetables and honey from the farms. The direct linking of FPOs and companies will improve quality of the crop and increase the income from processing and value addition.

Himachal Pradesh

A noteworthy feature of Himachal Pradesh is that the Government has entrusted the State Cooperative Department to make special rules for the FPOs to avoid all kinds of issues affecting farmers.

The Indian Institute of Technology (IIT) Mandi and Enabling Women of Kamand (EWOK) Society collaborate on setting up FPOs in Mandi district of Himachal Pradesh. NABARD has sanctioned Rs 35 lakhs to IIT Mandi and EWOK Society to promote and set up

three FPOs in three years. IIT Mandi will provide its expertise in tourism, rural marts run by self-help groups, engineering solutions for farm-friendly equipment, research on the impact of climate change on agriculture incomes (ET, 2020).

In order to promote agricultural diversification in the state, Himachal Pradesh Crop Diversification Promotion Project was implemented with the aid of Japan International Cooperation Agency (JICA) from June 2011. This project was implemented in five districts of the state in a planned manner till 2020. Zika Phase-II will be implemented in all the districts of the state in the next nine years (2021 to 2029-30). The project will be run by the Himachal Pradesh Agriculture Development Society. FPOs will be promoted under this project.

The government is promoting marketing through mandis and cold stores. 19 mandis are functioning under the e-portal in the state and 10 mandis will be connected through this portal, which will help in effective marketing by FPOs.

The Himachal Organic Farmers Forum is formed, which will be a non-Govt advisory body charged with steering and monitoring the growth and promotion of organic farming in the state towards fulfilling the vision, where people from across the sectors are represented. This will provide technical support to FPOs for organic production (http://indiaenvironmentportal.org.in>files>organic%20agriulture%20in%20hp.pdf).

Jharkhand

In Jharkhand, besides SFAC and NABARD, Bhoomi Ka has promoted FPOs for providing new business opportunities. Bhoomi Ka is a network of smallholder farmers, entrepreneurs, producer organisations, certification bodies and consumers promoting local food systems in Jharkhand. Under Bhoomi Ka with the efforts of the Centre for World Solidarity (CWS) and support from Welt Hunger Hilfe (WHH) Ajivika Bhoomi Ka Producer Company (ABPC) Limited was formed in 2016.

ABPC FPO procures grains from farmers certified under the Participatory Guarantee System (PGS). The farmers also do the processing and value addition at a Common Facility Centre (CFC) with women members of the groups. The FPO then aggregates, processes and supplies products to retail outlets in the local market as well as outlets in

Ranchi, Jamshedpur, Patna, Delhi and Kolkata. ABPC has its own FSSAI registration for its processing and packaging unit.

Jharkhand government initiated the 'Jharkhand Opportunities for Harnessing Rural Growth' (JOHAR) project, in 2017, with support from the World Bank. Farmers are collectivised into producer groups (PG) and FPOs, to gain improved access to inputs such as seeds, hatchlings, fingerlings, community-owned irrigation systems, markets, market intelligence, credit, and technical knowledge (JSLPS, 2020). JOHAR builds on the strong institutional platform of women's self-help groups established in the state under the World Bank supported National Rural Livelihoods Mission (NRLM). More than 2.10 lakh households in Jharkhand are linked to 3,900 farmer producer groups in 68 blocks from 17 districts of Jharkhand.

Agrarian Prosperity Programme (APP) in Gumla district of Jharkhand is initiated by Caritas India with the Scottish Catholic International Aid Fund (SCIAF) to ensure food security and higher income for the small and marginal tribal farm families. With the support of NABARD Jharkhand, APP has worked to promote five FPOs.

Karnataka

The Department of Horticulture, Government of Karnataka under various programmes viz., RKVY, NHM and Sujala III, has initiated the formation of FPOs during 2014-15 with the support of SFAC, New Delhi by mobilizing the Farmer Clusters already formed in the State. FPOs are mainly promoted by NABARD, Horticulture Department and Sericulture Department.

The Government of Karnataka established a Centre of Excellence for Farmer Producer Organisations (COE-FPO) during 2017 for the overall development of FPOs in Karnataka. The COE-FPO as an institutional mechanism will engage in policy analysis and develop a knowledge base within the state for gearing up the integrated development of FPOs. It will also serve as a platform for coordination among various departments and other related government agencies, NGOs, private sector firms, and other organizations (https://coefpo.org).

Karnataka has formulated FPO Policy, 2018 with a well defined institutional support structure such as State level Empowered Committee, a Nodal Department and a Nodal Agency, Expert Organisation and Knowledge Partner, State level departments as implementing agencies, Project Management Unit (PMU) at the individual department level, FPO Co-ordination and Monitoring unit at the district level, empanelled RI agencies for promotion of FPOs and FPO-Business Development Agency consisting of relevant persons from Industries and experts in Agri Business. Karnataka State Agricultural Produce Processing and Export Corporation Limited (KAPPEC) will undertake the responsibility of FPO-BDA (https://kappec.karnataka.gov.in).

Kerala

FPOs in Kerala have the mandate for production, aggregation, storage, processing, marketing and export of agricultural produce. Kerala is positioned as a hub for agri processing and investment destination for food processing sectors. FPOs in Kerala will be linked with the Agro Parks and Food parks established in the state. The government plans to promote FPOs in all the Blocks. The state government is also planning to form Kerala Agro-Business Company (KABCO) aiming at a major leap in the agriculture sector. Kerala Agricultural University (KAU) and the Department of Industries have joined hands to implement the One District, One Product programme under the Aatmanirbhar Bharat, to create micro-enterprises focussed on local strengths and brand creation. The programme is expected to support FPOs, SHGs and producers' cooperatives in the state (Martin, 2020).

Though there is no dedicated FPO policy in the State, the Government of Kerala's 2015 Agricultural Development Policy has a separate chapter on FPO policy which provides for promotion of FIGs and FPOs by handholding them with the provision of an expert for each FPO for professional management. It also extends all policy benefits at par with co-operatives. The policy also gives the credit provision role to FPOs for their farmer members. For the promotion of FPOs, the state SFAC is proposed as the Resource Institution (RI) in the state (Government of Kerala, 2015).

In Kerala, the key institution to coordinate the implementation of various schemes across departments will be the Resilient Kerala Initiative (RKI), a special purpose vehicle (SPV)

established following the 2018 floods. RKI funded by the World Bank is mandated to identify the state's agenda for change by selecting key reforms and investments across sectors that can help the state move towards greater resilience while partnering with various multilateral institutions, civil society entities and the community. With a strong focus to ensure FPOs have access to new information, market and technology, the constraints related to FPOs are identified, which will be addressed in the RKI project (https://rebuild.kerala.gov.in).

Madhya Pradesh

Madhya Pradesh is the first state in the country that established FPOs under the District Poverty Initiative Project (DPIP) with support from the World Bank. The state used the Private Companies Act and promoted 17 farmer producer companies under the MPDPI Project. Most of these private companies were registered in 2006 and supported by Action for Social Advancement (ASA). Of the 17 PCs promoted under the MPDPIP project, 14 were promoted directly by the DPIP, two by PRADAN and one by Srijan. ASA supported the projects during the first phase.

The second phase of six of DPIP PCs (2008-11) was supported by Sir Dorabji Tata Trust (SDTT), Mumbai. The Madhya Pradesh government has given a grant of Rs 25 lakhs to the FPOs formed under DPIP. Most of the MP DPIP PCs were in the seed production business, which involved a small number of members and a high cost. Therefore, it did not create member centrality and the large patronage needed for the PC to scale up. In 2012, there were 21 FPOs and several other informal farmer's groups covering over 100,000 farmers with a significant business turnover of Rs 40-50 Cr annually, involved in a variety of agricultural produce, with a predominance of seed production and processing, input supply, and aggregation of produce (SFAC, 2012).

Madhya Bharat Consortium of Farmer Producers Company Limited (MBCFPCL), a state-level conglomerate of FPCs was established in September 2014. MBCFPCL, a profit organisation registered under the Companies Act is jointly promoted by Government organisations like SFAC, Govt of India, Department of Farmer Welfare and Agriculture Development, Govt of MP, MP State Rural Livelihood Mission and prominent development organisations like Rabo Bank Foundation, ASA, Vrutti, ADS, IGS, MCM. MBCFPCL

which is a state-level federation of FPCs had 65 FPOs as shareholding members as of 2017 (https://mbcfpcl.org).

The objective of the Consortium is to create umbrella support to member FPOs particularly on the market, financial linkages, brand development, value addition, agricultural extension, insurance and leverage and transfer the benefits of the economy of scale. The main functions include aggregation, storage, primary processing and trading of farm produce; backward integration for agriculture inputs to member FPOs for sustainable farming and extending linkages for financial services.

Maharashtra

In Maharashtra, most of the PCs are either NGO or farmer initiated and managed. Some of the FPOs in Maharashtra are organically evolved with farmers taking the lead and coming together to adopt market-oriented practices. These groups started with a narrow focus, then evolved as independent business entities, formalizing into FPCs.

Maharashtra is the first state in India to create an enabling environment for setting up Private Markets. There are 57 Private Markets established and run by private entrepreneurs. The state has promoted Direct Marketing to enable a more flexible environment. 1064 Direct Marketing Licenses were issued, out of which 400 licenses have been issued to the FPOs.

Maharashtra provides more incentives to FPOs, such as:

- 50% discount on storage charges of agri produce in Maharashtra State Warehousing Corporation (MSWC)
- Free direct market licenses to FPCs given by the Directorate of Marketing.
- Interstate 50% transportation subsidy given to FPCs for agri produce trade. This subsidy is given by the Maharashtra State Agricultural Marketing Board (MSAMB) https://www.msamb.com).
- Priority is given to FPCs to trade market their produce in the weekly market organised by MSAMB.

- Under several agriculture schemes, priority/preference is given to FPCs in crop production, seed production, farm equipment etc.

Maharashtra Agricultural Competitiveness Project (MACP), a World Bank funded project operated by MSAMB, Pune has the following components:

- Intensification and Diversification of Market led Production
- Improving Farmers Access to Markets
- Project Management, Learning & Adjusting
- Agri-business Promotion facility (ABPF) - The ABPF have initiated activities of preparation of business proposals.

The Government of Maharashtra with the funding support of the Asian Development Bank (ADB) is implementing the 'Maharashtra Agribusiness Network Project' (MAGNET). The project target is to support FPOs by improving a network of post-harvest marketing and value chains focusing on the identified horticulture crops. ADB will add value through an integrated approach addressing capacity development, financial support, and infrastructure development. (https://www.adb.org>projects: 53264-001: Maharashtra Agribusiness Network Project)

The project is aimed at increasing the incomes of small and marginal farmers in Maharashtra in line with the state government's Vision 2030 by providing holistic agribusiness and value chain support in horticulture. The project will enhance (i) the capacities of agribusiness institutions and Farmer Producer Organizations (ii) access to finance of FPOs and value chain operators (VCOs), and (iii) horticulture value chain infrastructure.

Meghalaya

The first FPO (Marang) in West Khasi Hills in Meghalaya was inaugurated in January 2021 enabled by NGO Dawn with NABARD as the sponsoring agency. Marang FPO aims at encouraging farmers in collective action particularly on poultry farming, to take up poultry activity on a bigger scale, help farmers in marketing the products at a premium price, and in due course processing of the products.

Farmers' Collectivization for Upscaling of Production and Marketing Systems (FOCUS) is a flagship initiative of the State Government. It is an innovative welfare programme, whereby the Government ensures that the farmers are able to enhance their productivity as well as avail benefit of credit linkages and strengthen access to markets. Through this programme, the Meghalaya Basin Management Authority (MBMA), the nodal implementing agency identifies production clusters of marketable produce, focuses on Value Chain Analysis of the produce, forming bottom-up small collectives known as Producer Groups (PGs), identifying and training extension service providers known as Service Producers (SPs) and building large collectives in the form of Cooperative Societies and FPOs through bringing together well functioning PGs (https:// mymeg.meghalaya.gov.in>scheme-focus).

The Meghalaya Farmers' (Empowerment) Commission Act, 2019 provides for the empowerment of the farmers of Meghalaya. The Commission act as a bridge between the farmers and the Government and would, inter alia, study and identify key issues of the farmers in Meghalaya as also suggest remedial measures to make the farming sector more attractive and remunerative for farmers and youth.

To address the various challenges and empower the farmers of the state, the Government of Meghalaya launched an innovative helpline, 1917, which is accessible from all telecom service provider networks of the state and certain telecom circles outside the state. This number is based on the Integrated Technology Enabled Agri Management System, also referred to as 1917-iTEAMS. The goal of the initiative is to provide a platform for the farmers and related stakeholders in the state agricultural sector to network and connect and establish direct lines of communication with markets across the globe (Department of Agriculture, 2018).

Odisha

The Director of Horticulture is identified as the coordinating RI for Odisha, while the concerned line Directorates will be the RI for the FPOs in their relevant fields. Each line department (Agriculture, Horticulture, Fisheries, Animal Husbandry, etc.) will have its own RI & PMU at the Directorate level. These RIs will be responsible for the identification of Producer Organisation Promoting Institutions (POPIs), identification of potential of each GP and development of Business and Development Plan of each FPO.

Odisha's FPO policy (2018) is very comprehensive and progressive and provides for treating PCs at par with co-operatives, which reduces the compliance burden on FPOs. The Single Window Clearance System by the Department of Agriculture and Farmers' Empowerment will be made applicable to FPOs for the issue of licenses for trade in inputs, production and processing. It even aims to provide land for FPOs at a concessional rate for setting up exclusive storage, sorting, grading yards and processing plants (https://www.agriodisha.nic.in>contents>FPO POLICY).

The Government of Odisha will establish an Information and Support Centre for FPOs at the Directorate of Horticulture in association with other Departments. This support will include website management containing information relevant to FPOs. The Information Centre shall maintain databases on FPOs and will have information on the activities undertaken by the FPOs in Odisha.

Producer companies in Odisha are being promoted under many central and state government schemes. FPOs are established under the State government programmes such as Odisha Livelihood Mission, Odisha Millets Mission, Promotion of Agriculture Production Clusters in Tribal Regions of Odisha, etc. Currently, a grant of Rs. 8.00 Lakhs per block is approved under Odisha Millets Mission for 3 years to support the FPOs.

The PCs are promoted in a two-tier model, comprising multiple supplier PCs together with a market-facing company at a block or district level, collectively handling multiple commodities, value addition and marketing. The market-facing company can be a producer company or a private company linked with an agriculture entrepreneurship scheme.

Punjab

NABARD signed the first MOU for promoting an FPO under PRODUCE Fund in Punjab during 2015. Some producer organizations had already been existing in Punjab and had later been federated as FPOs under the PRODUCE Fund. But none of the SFAC promoted FPCs in Punjab entered the stage of business expansion.

The Punjab government has taken a policy decision to cut substantial area under wheat and paddy. As part of the diversification programme, the government has established five Citrus Estates in the State aimed to increase the production of citrus fruits (Kinnows) and

to improve the quality of the crop. The Citrus Estate established by the Government of Punjab through the Department of Horticulture in the kinnow growing area of Hoshiarpur is unique in the state and has received substantial state grants under the state plan (Rs.530 lakh) as also Rashtriya Krishi Vikas Yojana (Rs. 451 lakh). The Citrus Estate thus is a special case of FPO in Punjab. The National Horticulture Research and Development Foundation, New Delhi has studied the value chain strategy of kinnow in Punjab (NHRDF, 2018), which has provided a boost to FPOs involved in the production of kinnows.

Punjab Agri Export Corporation Ltd (PAGREXCO) is identified as the State Nodal Agency (SNA) to function as a catalytic/ facilitating agency to promote agri business activities through FPOs in Punjab. SNA will act as a single window institution to FPOs and to facilitate linkages to investment, technology and the market. This nodal agency would appoint FPO Mittar for helping FPOs on a day to day basis for their operations and for preparing business plans.

A State Level Committee (SLC) is constituted under the Chairmanship of Additional Chief Secretary (Development), Punjab. This committee will review the work of the SNA and approve the proposals of FPOs. The Food processing sector will be the focus area in Punjab and farmers will be linked to the processing units.

The government has initiated the process for customisation of the FPO scheme and set up 'Kheti Kosh' to receive funding from corporates to strengthen the agricultural sector. Punjab Agricultural University (PAU) has been roped in to constitute a committee for formulating a customised FPO policy. A dedicated fund, 'Kheti Kosh', is also being set up to receive funds from corporates wishing to donate under the Corporate Social Responsibility (CSR) (The Tribune, 2018). An amount of Rs 50 crore has been approved for the PAU to set up an incubation facility for young farmers and graduates in agriculture, who form their FPOs.

The policy provides for handholding by the state departments concerned and universities of agriculture as resource institutions, but the challenge is whether these agencies are equipped with the requisite skills to impart training, promote and develop an agricultural entity into a successful business enterprise.

Rajasthan

The proofing of the concept of FPO as a vehicle of doubling farmers' income has been done very well in the first decade of FPO development in Rajasthan. Many FPOs in the state have been able to undertake bulk procurement from member farmers for pulses at MSP/PSS for the public procurement system.

Access Development Services (ADS) is a not-for-profit, section 25 company set up in 2006 funded by the Department for International Development (DFID) and implemented by CARE India. ADS as a part of the consortium implementing the National Agricultural Innovation Project (NAIP) in Southern Rajasthan, has organised four Producer Companies in Rajasthan. ADS has taken the existing microfinance project and adopted a three-pronged strategy to improve livelihoods which involved the organization of producers, aggregation of demand and supply, and linkages with value chains.

The Agriculture Department, Rajasthan shall be the nodal department for all administrative purposes and Rajasthan State Agricultural Marketing Board (RSAMB) shall function as the Nodal Agency and assist the State Level Consultative Committee in all matters pertaining to the formation and support for FPOs in the State.

Many FPOs in Rajasthan are using online market platforms to auction their produce providing a larger landscape to farmers. The Rajasthan State Agricultural Marketing Board has already taken a firm step in this direction by launching Rajasthan Agro-processing, Agri-business and Agri-exports Promotion Policy 2019 and by provisioning of higher leverage to FPOs through financial and procedural measures. The scheme provides many benefits to farmers such as capital investment subsidy, interest subsidy on term loans, electricity tariff/ solar energy subsidy and freight subsidy (https://agriculture.rajasthan.gov.in>schemes).

Some of the positive interventions are:

1. The Government of Rajasthan considers and recognises FPOs at par with cooperatives for all benefits and facilities that are extended to member owned institutions from time to time.

2. The state through the nodal department/implementing agency works to develop a single point solution for application and clearance system for various licenses like seed/fertilizer/insecticide retail marketing license, seed production license, mandi license, FSSAI, registration under weights and measures Act, Service tax number, warehousing, etc. required for FPOs. This will aid in "Ease of doing farming".

3. FPOs establish Agri Business Centres "Krishi Vyapar Kendra" for Agri-Input sale, Primary and Secondary value addition units and small warehouse facility for local storage; which can be utilized by member or non-member farmers on a fee-based model.

4. A separate integrated FPO portal is created as a multiple purpose platform for consolidating the database of all FPOs, contact details, crop calendars, production details especially for organic production and also traceability.

Sikkim

Sikkim, the first organic state in India during the first phase of the Organic Mission has set an example for practicing agriculture in an environmentally sustainable way. The Government of Sikkim has launched Sikkim Organic Mission 2.0, which aims to enable better market access, pricing for organic produce to farmers in Sikkim.

Sikkim Organic Farming Development Agency (SOFDA) under the Agriculture department is involved in the promotion of FPOs in the state. A policy roundtable on "Sustainability of FPOs" was held in Gangtok, Sikkim during November 2017, in partnership with Integrated Mountain Initiative and Green Economy Coalition. The initiative was supported by Heinrich Boll Foundation and the European Union. The consultation gathered challenges that small farmers in Sikkim face and the opportunity in FPOs to enable better livelihood security and environmental sustainability of agriculture (Development Alternatives, 2017).

Sikkim has passed Sikkim Well-being of Generations Bill, 2017, which will incentivise development planning of the state in line with the Sustainable Development Goals.

The Livelihood schools in Sikkim organise professional training for FPO staff which can very well form part of these livelihood schools. Focus is given on the capacities of FPO to expand and increase the volume of their business. Sikkim will be the first state in India to

have legislation on the SDGs and will be one of the few states of the country, along with Assam, Madhya Pradesh and Kerala to actively incorporate the SDGs framework into their development planning (Alternative Perspectives, 2017).

There is a conflict of interest regarding support from the Government in Sikkim, which is only oriented toward increasing the yield of commercial production for markets, which includes four main crops - large cardamom, ginger, turmeric and buckwheat. Their main thrust is advancing monocultural organic production for export production in a market, rather than a livelihood-led approach.

Tamil Nadu

Tamil Nadu Small Farmers Agri Business Consortium (TNSFAC) is the nodal agency for the promotion of FPOs having Farmer Interest Groups (FIGs) as its building blocks, utilizing various scheme funds. The Department of Agricultural Marketing and Agri Business has promoted many FPOs, which are not more than five years old and face various challenges. The TN Irrigated Agriculture Modernization (TNIAM) Project also supports the FPOs with a business promotion fund and business expansion grant.

Taking into consideration the growing number of FPOs, the Government of Tamil Nadu formulated the "Farmer Producer Organisation Policy" exclusively for the FPOs. The FPO policy was unveiled in February 2020. The Policy is being formulated to address the issues and challenges faced by FPOs.

Tamil Nadu Consortium of Farmers Producer Company Ltd was established for bringing a 'corporate culture' into the farmer-owned and managed FPOs. The organisation believes in achieving this ideal in all FPOs uniformly and evenly so that such member-owned institutions will become sustainable in managing their business by incorporating value systems and ethics in business. The organisation will ensure adequate paid service to member FPOs to transform production driven agriculture to market driven agriculture.

Tamil Nadu is the first state in the country to provide a comprehensive scheme to finance FPOs. The scheme consists of three components:

1. Mezzanine Capital Assistance (MCA) - MCA will be a margin fund corpus constituted with a lending agency that will invest in the capital of FPCs.

2. Credit Guarantee Scheme (CGS) to access credit - CGS will encourage and provide comfort to the institutional lenders to lend to the FPCs through Credit Guarantee by providing 50 per cent guarantee cover for loans not exceeding Rs.1 crore.

3. Revolving Fund Support (RFS) to avail concessional credit - By blending cost free funds from the Government and market borrowed funds from NABKISAN, the scheme will reduce the lending rate for the FPCs to about 8-9 per cent (https://www.nabkisan.org).

FPOs in Tamil Nadu have a good convergence with Tamil Nadu Organic Certification Department (TNOCD), TN Food Processing Policy 2018 and Tamil Nadu Protected Agricultural Zone Development Act 2020 and Supply Chain Management Project (TNSCM), a flagship project in Agricultural Marketing. TNSCM is funded under the Warehouse Infrastructure Fund (WIF) of NABARD for creating state of the art infrastructure facilities for primary processing and creating market linkages to handle fruits, vegetables and other perishable commodities in the select districts of Tamil Nadu (https://tnscm.co.in).

Telangana

The policy of Telangana is that FPOs must evolve into a movement of autonomous farmer-owned business organisations providing much needed services to their members. The Director, Dept of Agriculture Marketing, Telangana is identified as the Nodal Officer and the Agriculture Marketing Dept as the Nodal Department for FPOs in the state. Agriculture Marketing Department will have a competent team of professionals (FPO Cell) drawn from important departments of Govt of Telangana to support the development of FPOs as business entities. In Telangana, approximately 400 FPOs have been promoted by various agencies such as SFAC, NABARD, SERP, State Govt. departments and NGOs.

Sahaja Aharam Producer Company (SAPCO) is a federation of 23 organic FPOs in Andhra Pradesh, Telangana and Maharashtra established by the Centre for Sustainable Agriculture (CSA). The company owns an end-to-end supply chain sourced from 100% certified organic farms and processed at exclusive certified Organic Processing facilities. Over 200 products are sold under the brand name Sahaja Aharam (https://sahajaaharam.com). As a resource organisation, CSA has facilitated the formation of

over 200 FPOs in Telangana with the support of NABARD and is now acting as a resource organisation for over 200 FPOs in AP and Telangana. eKrishi FPO hub is an ERP system for FPOs developed by CSA. Digitising FPOs helps in efficient management and transparency.

A State Level Producer Company is proposed to be established in Telangana as a membership based organization and consisting of FPOs as members and shareholders in line with Rythu Farmers Producer Company incorporated during December 2014, promoted by five producer companies from Mahbubnagar and Medak districts. The Board of Directors (BODs)will be supported by the Advisory Committee (AC) at strategic level. The Advisory Committee consists of empanelled representatives of Indian Grameen Services, other Resource Institutions, banks and other experts. The State Level Steering Committee on FPOs will be constituted with appropriate sub-committees on themes like bank linkages, food processing, collective marketing etc. The members of the State Level Steering Committee will be drawn from relevant govt. departments, resource NGOs, banks, private sector players and training institutions.

Kamareddy Progressive Farmers Producer Company Ltd (KPFPCL) is an FPO promoted by Reliance Foundation (RF) under its rural transformation initiative 'Bharat-India-Jodo' (BIJ) in 140 villages in the district. The FPO has become a game changer and serves as a single window for produce aggregation, marketing, input supply, financial services, value addition and linkages with other stakeholders for bringing economic freedom to the member households (Press Trust of India, 2019).

Uttar Pradesh

Uttar Pradesh came out with a new policy on forming and incentivizing FPOs (2020) of the two crore small and medium farmers in the state so they can get a better price for their produce. The new FPOs will be linked to various government departments under convergence mode, which is seen as an attempt to help the FPOs get direct benefits from the various government schemes. The mission is to encourage the agricultural sector as an organised business and eliminate the uncertainties associated with the farming business. The FPOs will be made atmanirbhar in terms of working, by making them strong financially and technically (Aman Sharma, 2020).

The FPOs can operate at the district, state and national level for the product identified as per their requirement of processing, branding and marketing. One district, one product policy adopted by the Government of UP to identify one unique product from each of the 75 districts and create a product-specific brand will get a thrust under this initiative.

Uttar Pradesh is planning to create a dedicated body, on the lines of Udyog Bandhu, to assist the enterprising FPOs in investing in projects for post-harvest infrastructure management and community farming assets with the help of the Agriculture Infrastructure Fund (AIF) of the Central government. Udyog Bandhu is an organization of the State Government of Uttar Pradesh dedicated to facilitating investment in Industrial and Service Sectors, besides solving various problems of existing and upcoming industries as well, related to different Government departments.

The Uttar Pradesh government has opened the state's first private marketplace for farmers in Agra. The market, operated by a group of 600 farmers, could improve agribusinesses in Agra and its adjoining districts. Divya Bhoomi Agricrop Producer Company has also proposed to build a private market on the Agra-Gwalior Highway. It will be the first FPO market of Uttar Pradesh.

Uttar Pradesh launched the UP FPO Shakti Portal as part of the Kisan Kalyan Mission during March 2021. The portal, the first of its kind in the country, has been developed by the Department of Agriculture with the support of the Bill and Melinda Gates Foundation and is aimed at benefitting the farmers at the grassroots level (http://www.upfposhakti.com)

Uttarakhand

The Government of Uttarakhand has launched several new schemes viz. Apple Mission for cultivation of Ultra High Density Apple, Walnut Mission, Small Nurseries, Production of off-season vegetables, Vermicompost units etc. The Centre of Excellence on temperate fruits for Rs. 5.00 core is being setup under Horticulture Mission for North East and Himalayan States (HMNEH) by Uttarakahand University of Horticulture and Forestry (UUHF), Bharsar.

Uttarakhand Krishi Utpadan Mandi Parishad (UKUMP) is the nodal agency responsible for agricultural marketing in the state. A separate Horticulture Marketing Board has been set up to promote marketing of horticulture produce and to ensure a better price of the

produce to farmers (http://www.ukapmb.org). The state has also placed itself at the first position among the Himalayan states category, by ensuring the presence of basic export facilities and infrastructure, a conducive business and export environment and export performance, according to Export Preparedness Index (EPI) 2020 report released by NITI Aayog, Government of India in August 2020 (http://www.niti.gov.in>social-sector-indices).

Uttarakhand is one of the leading fruit cultivating states in India. The State has vast export potential for fruits and agricultural products such as honey, mushroom, rice, maize cereals, etc., spices, horticulture and floriculture. HMNEH States encourage aggregation of farmers into farmer groups like FIGs/FPOs and FPCs to bring economy of scale and scope.

West Bengal

Connect FPO Confederation is an association of FPOs and Farmer Producer Companies promoted in West Bengal under various schemes of the Government of India and the Government of West Bengal. Connect FPO e-marketplace was launched in August 2021 to ensure fair trade practices and better price for farmers in West Bengal (https://www.connectfpo.com).

With a view to eliminate middlemen and enhance coordination between farming and the food processing industry, the West Bengal government has set up 17 FPOs across the state. These FPOs will act as mediators and quality controllers between the food processing company and farmers.

Ambuja Cements Federation (ACF) acts as a catalyst and supports in organising farmers and establishing their own FPO. ACF plays a critical role in supporting the governance of these organisations to ensure their long term sustainability. ACF helps each FPO in the joint bulk procurement of a variety of inputs for farms, including fertilisers, and organic insecticides.

West Bengal Essential Commodities Supply Corporation (WBECSC) Limited was incorporated by the Government of West Bengal with an objective of supplying essential commodities in the state with a view to stabilize the market price as well as to ensure the availability of such commodities to the people of the state. Food and Supplies Department has included FPOs for paddy procurement at MSP through its Custom Milled Rice Agency

(CMRA). At present, WBECSC is acting as CMRA to engage FPOs to procure paddy (https://wbecscegovernance.com).

Conclusion

Sharma (2021) has indicated survival challenges and hurdles that could derail FPOs as lack of distinctiveness, audience diversity, ambiguous market category, multiple thresholds for success, limiting procurement only from farmers, etc. The overview of FPOs operating in various States in India related to policy and supporting initiatives presented in this article has reinforced the need for addressing the challenges through appropriate policy measures, convergence efforts and innovative governance mechanisms. The review of FPOs across states in India revealed that FPOs should go for valuation, branding, state of the art packaging and also comply with quality standards. There is a need for more research studies on the impact of convergence and support measures adopted by various state governments on the performance of FPOs.

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Restraints and Propositions for Vegetable production in Ranga Reddy district of Telangana

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Abstract

Ranga Reddy district is a peri-urban area cultivating vegetables. Vegetable growers in the area expressed dissatisfaction with their economic situation. This study was taken up to analyse the constraints faced by respondents to give a clear picture of the current scenario. Purposive sampling of mandals and villages followed by proportionate sampling led to a sample size of 150 respondents, who were contacted and data collected using a structured interview schedule. This study highlighted that unavailability of labour was the major production-related constraint and price fluctuation was the foremost market-related constraint. Suggestions by the respondents to uplift their economic situation included implementing minimum support price and exploring new marketing systems such as Retail marketing. In addition, they suggested that post-harvest infrastructure development like transport, storage, processing activities, promotion of export activities need to be focused on.

Keywords: Farmers, Vegetable production, Constraints, Suggestions.

Introduction

Vegetables are an excellent source of nutrients, including vitamins A and C, riboflavin, thiamine, and niacin, minerals such as calcium, phosphorus, iron, and proteins in our diet. India stands as the second-largest producer of vegetables, following China, with an area of 10.3 million hectares producing 1,89,464'000 MT (Pocketbook of Agriculture Statistics, 2020). Even with increased production, India still lags in addressing hunger and malnutrition issues which urges the nation to create alternative and efficient marketing systems with infrastructure development.

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Focus on an efficient marketing system helps directly in raising farmers' income which is the need of the hour. High charges posed by intermediaries, defective weighing and lack of market place stood in the top three constraints highlighted (Ahmad et al., 2017) by Bihar vegetable growers whereas unavailability of quality seeds was a restraint claimed by potato growers (Singh et al 2018). This emphasizes that constraints faced by the vegetable growers are area-specific for which appropriate measures are needed.

The study area, Ranga Reddy district, favours the cultivation of horticulture crops with 58,318 acres under vegetable production in the year 2019-2020 making it a leading producer compared to other districts of Telangana with a production of 3,85,135 MTS. Still, the economic satisfaction of farmers was not achieved. Therefore, the following study was conducted to examine the constraints faced by the vegetable growers with regard to the production and marketing of produce. This study aimed for a better understanding of the current situation and suggestions perceived by respondents to improve the situation.

Methodology

In Ranga Reddy district of Telangana, three mandals, namely Chevella, Ibrahimpatnam, and Shabad, were purposively selected based on three years' average of acreage allotted under vegetable production. According to the Rythu Samagra Samachara Sekara (RSSS) 2020-21 data of the area under vegetable production, three villages from each mandal were chosen as the study areas. Proportionate sampling was followed to select the number of farmers to be contacted from each village. A total of 150 respondents were approached through simple random sampling to collect responses. Based on a thorough review of the literature and preliminary discussions with farmers, horticulturists, agriculturists and extension officers, the constraints were listed and divided into two categories viz., Production and Market-related. A well-structured interview schedule was prepared and pre-tested.

Responses were collected using a three-point continuum scale and quantified using the Constraints Faced Index (CFI).

CFI = No. of respondents opted constraint as very much a problem*3 + No. of respondents opted constraint as somewhat a problem*2 + No. of respondents opted constraint as not at all a problem*1

The suggestions for improvement of the economic situation of farmers were quantified using frequency and percentage based on which rankings were given.

Results and Discussions

It could be observed from table 1 that non-availability of labour was marked as the topmost constraint followed by the high cost of fertilizers and plant protection chemicals and the problem of pests and diseases at Rank II and III. The respondents complained about labourers' preference towards Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) work (100 days of employment) over the fieldwork. In addition, harvesting of vegetables needed to be completed before the daybreak to reach marketplaces early in the morning (3:30 to 4:30 am) with fresh vegetables. Tedious vegetable harvest associated with odd work hours was not favoured by the labourers who demanded additional wages.

The lack of seed or nursery material and insufficient irrigation facilities were issues of concern ranking at IV and V. Lack of finance/credit facility was ranked last by vegetable growers (VI). Due to the government's declaration of free power, 24*7 for farmers the respondents did not express dissatisfaction with the power supply.

Table 1. Production Related Constraints Faced by Vegetable Growers (n=150)

S.No.	Constraints	Very much a problem (3)	Some what a problem (2)	Not at all a problem (1)	Constraint Faced Index (CFI)	Rank
1	Non-availability of labour	91	18	41	350	I
2	High cost of fertilizers and plant protection chemicals	79	23	48	331	II
3	Problem of pests and diseases	34	47	69	265	III
4	Non-availability of seed or nursery material at the time of sowing/planting	2	29	119	183	IV

5	Inadequate irrigation facilities	0	15	135	165	V
6	Lack of finance/ credit facility	0	11	139	161	VI
7	Limited or irregularity in power supply	0	0	150	150	VII

With regard to the marketing-related constraints, fluctuations in market prices were very much a problem for the majority of respondents and ranked as number I. It could be reasoned as market prices for vegetables were found to be extremely unpredictable, varying not only from day to day but even from hour to hour. After the sale of the produce, farmers received just enough to cover their production costs, but on down days, they were short-changed, unable to meet transportation and labour costs.

Subsequently, high cost of transportation, markets being far away and exploitation by middlemen were ranked II, III, IV, respectively. Further, concerns related to the market were high commission charges, lack of market information ranked as V and VI respectively.

Table 2. Market-Related Constraints Faced by Vegetable Growers (n = 150)

S.No.	Constraints	Very much a problem (3)	Some what a problem (2)	Not at all a problem (1)	Constraint Faced Index (CFI)	Rank
1	Fluctuation in market prices	95	28	27	368	I
2	High cost of transportation	49	29	72	277	II
3	Markets are far away	36	32	82	254	III
4	The exploitation by middle men	19	41	90	229	IV
5	High commission charges	16	35	99	217	V
6	Lack of market information	17	26	107	210	VI
7	Lack of processing facilities	7	26	117	190	VII
8	Inadequate infrastructure facilities in the market	6	22	122	184	VIII

9	Illegal deductions while selling	4	12	134	170	IX
10	Hamali charges (Labour charge for loading and unloading of goods) are more	2	7	141	161	X
11	Prolonged transactions (Taking long time while marketing)	2	3	145	157	XI
12	Faulty system of weighment	0	0	150	150	XII
13	Delayed cash payments	0	0	150	150	XIII

The hurdles such as lack of processing facilities, inadequate infrastructure facilities in the market, illegal deductions while selling were ranked as VII, VIII and IX as may be seen in Table 2. Vegetable growers ranked higher hamali charges at X, and prolonged transactions as XI. The respondents opted for credible commission agencies. The respondent vegetable growers did not state faulty payment systems and delayed cash payments as an issue.

These results are consistent with investigations of Pandit and Basak (2013), with vegetable farmers in commercial cultivation, Rohit et al. (2017) who probed respondents about problems in peri-urban vegetable cultivation, and Rai et al., (2019), who discussed with Nepali farmers regarding their constraints in commercial vegetable cultivation.

The responses of the vegetable growers, concerning suggestions for improvement of existing marketing systems, for their economic upliftment are presented in Table 3. More than three-quarters (78%) of the vegetable growers expressed the need for Standardized / Minimum Support Prices (MSP) for vegetables. Nearly half of the sample (48%) wished to explore new marketing systems such as retail marketing to improve their existing marketing situation, and 38 per cent suggested the need to have more procurement centres nearby.

Vegetable growers believe that a Standardized/Minimum Support Price could be a useful approach to deal with market price fluctuations. The role of retail market places in lowering transportation costs may contribute to higher income, hence respondents were interested in learning more about it.

Table 3. Suggestions for Economic Upliftment as Expressed by Vegetable Growers.

S. No.	Suggestions	*Number	Per cent (%)	Rank
1	Standardized / Minimum Support Prices for the produce	117	78.00	I
2	Explore new marketing systems - Example- retail marketing	72	48.00	II
3	More procurement centers at nearby places	57	38.00	III
4	Form cooperatives for collective marketing	48	32.00	IV
5	Provide access to market information	42	28.00	V
6	Improving physical facilities at markets	18	12.00	VI
7	Protection from the exploitation of middlemen	10	6.67	VII
8	Providing timely and immediate payment	4	2.67	VIII
9	Providing concessional transportation charges	1	0.67	IX

About 32 per cent of the vegetable growers suggested forming cooperatives to boost marketing, and 28 per cent suggested providing access to market information. Improving physical facilities at markets (12.00%), protection from middlemen (6.67%), timely and immediate payments (2.67%) and concessional transport charges (0.67%) were a few other suggestions by the vegetable growers. These results are in line with Baban (2012) when scrutinizing the vegetable growers' marketing behaviour, and econometric analysis carried out by Kondal (2016).

Conclusions

Irregularity in power supply, was reported as the topmost constraint by Singh et al (2020), but vegetable growers of the study area had not complained about it, confirming the area specificity of problems. Lack of market information and processing facilities were not indicated as problems, by the majority of respondents. It does not mean the existence of such facilities but conveys the disinterest of the respondents. It underlines the need of motivating the vegetable growers to avail better communication systems involving extension

officials combined with information technology. The creation of infrastructure like cold storage, processing units, and facilitating exports are in the hands of the government.

As an immediate solution, minimum support price will cater to the economic needs of respondents and motivate them towards farming. However, measures are required, to strengthen the post-harvest systems. Along with this, developing new marketing systems viz., Retail markets will help farmers in obtaining better prices.

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